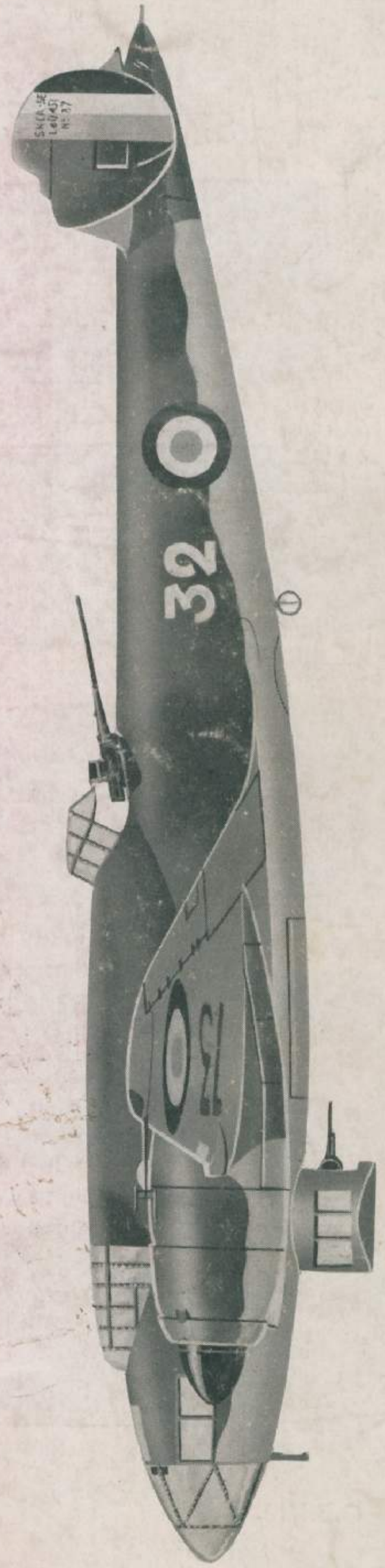
PROFILE PUBLICATIONS

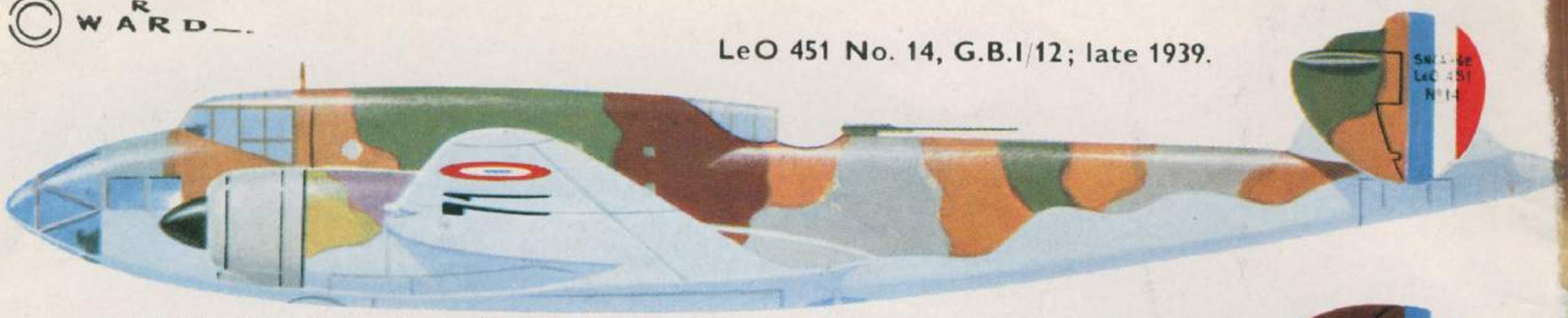
The Lioré et Olivier LeO 45 Series

NUMBER 173



© WARD

LeO 451 No. 14, G.B.I/12; late 1939.

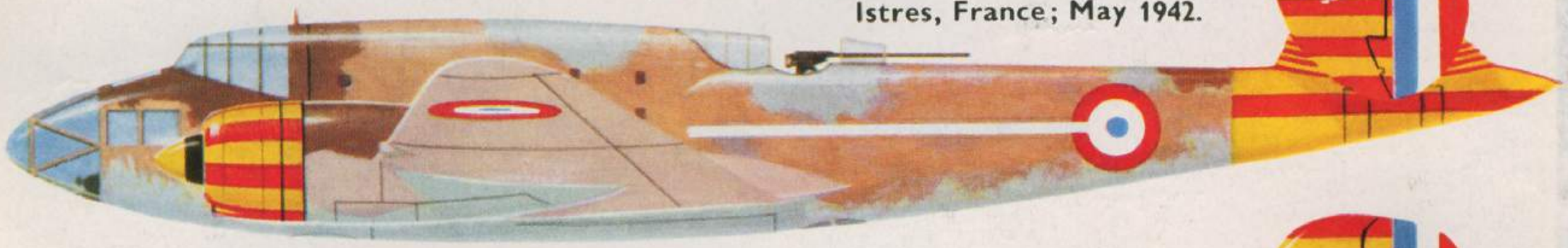


LeO 451 No. 378, G.B.I/11, 1st Escadrille, at Oran-La Sénia, Morocco; mid-1941. Note the aircraft number under the nose insignia.

LeO 451, G.B.I/25, 1st Escadrille, at Tunis-El Aouïna; early 1942.

LeO 451, G.B.I/31, at Istres; early 1941.

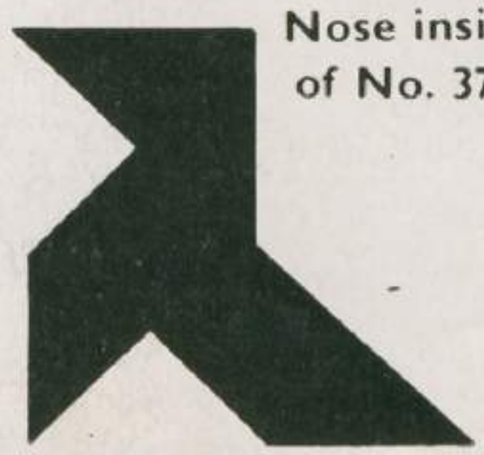
LeO 451 flown by Commandant Fine, C.O. of G.B.I/12, Istres, France; May 1942.



LeO 451 as flown after the Invasion of the Free Zone.

G.B.I/25.

Nose insignia of No. 378.



G.B.I/11.

G.B.I/12.

The Lioré et Olivier LeO 45 Series

by Raymond Danel

More commonly and familiarly called the "LeO 45", the Lioré et Olivier 45 occupies a special place in French aviation history. It was the only French aircraft that, having taken part in the 1939-40 campaign, remained in active service twelve years after the end of World War Two; four years more than the Dewoitine D.520 (see *Profile* No. 135).

At the outbreak of the war, in spite of its impressive weight and dimensions the LeO 45 was comparable in maximum level speed with the best serving French fighters, the M.S. 406 (see *Profile* No. 147), M.B. 151 and 152, and the Curtiss Hawk 75 (see *Profile* No. 80). Hence, the first draft of the technical handbook drawn up by the S.N.C.A.S.E. presented the LeO 45 as follows:

> " . . . Further to its 480 km./h. (298 m.p.h.) speed, very close to that of the enemy's fighters, it is not possible to attack the LeO 45 except from the rear. When the pilot then selects full throttle, as the cannon is not masked by any central fin, the attacking fighter offers itself in front of the cannon . . . "

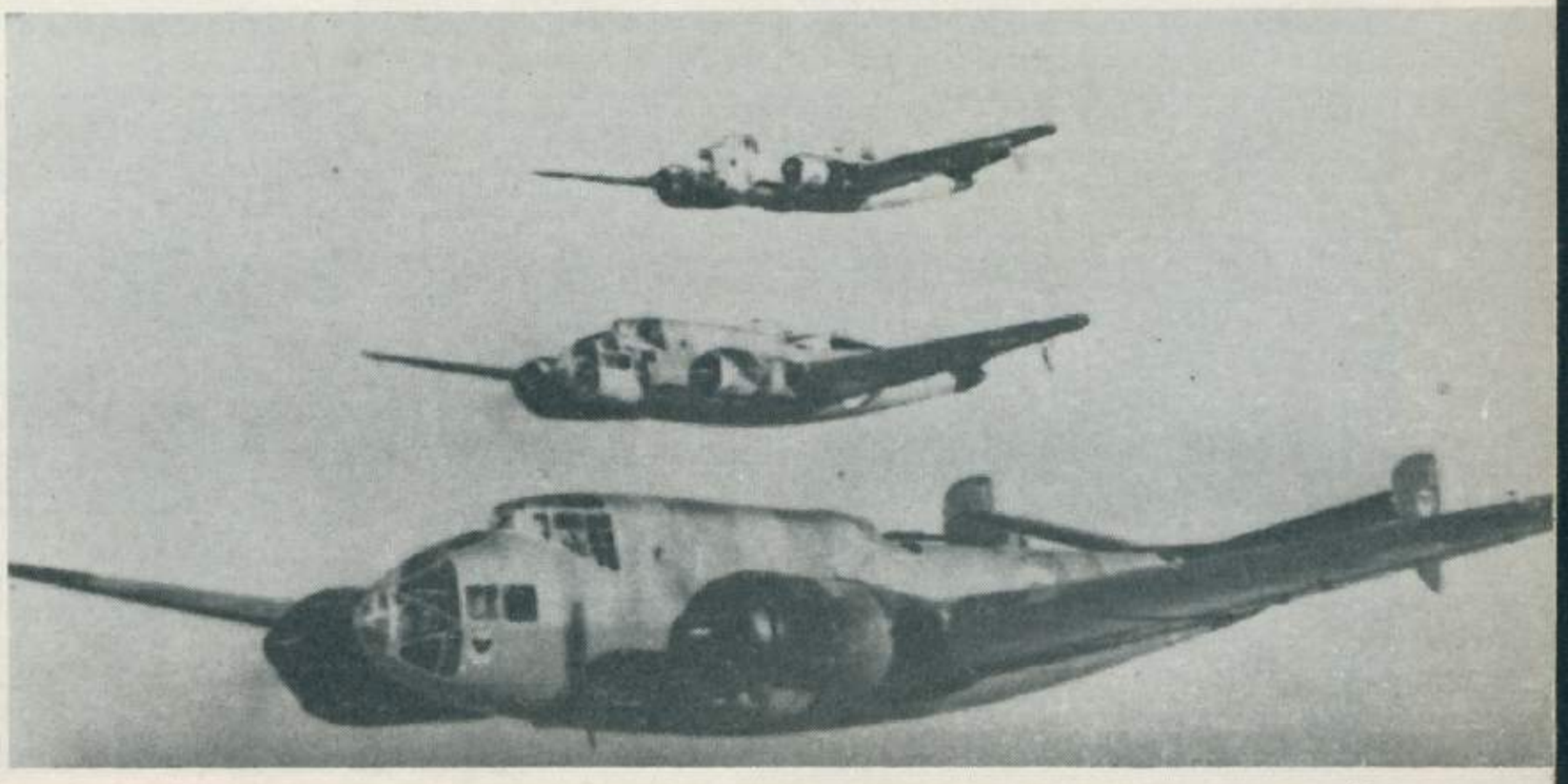
In spite of a few minor deficiencies, it was very popular with the French bomber crews who converted to the LeO 45 in 1939-40 from such obsolete types as the Bloch M.B. 200 and 210. It has been judged one of the best medium bombers in service anywhere in the world at that time. Unfortunately there were too few LeO 45's to materially affect the war situation in May 1940. The French Air Force and the Blenheims and Battles of the A.A.S.F. were unable to halt the German armoured columns during the Battle of France. They were vainly sacrificed in low level attacks for which they were not intended, during which they became easy prey for the defending "flak" and light infantry machine-guns. Also, during these low-level attacks, the protecting Bf 109's were able to create havoc among the attacking bombers.

THE BIRTH OF THE LeO 45

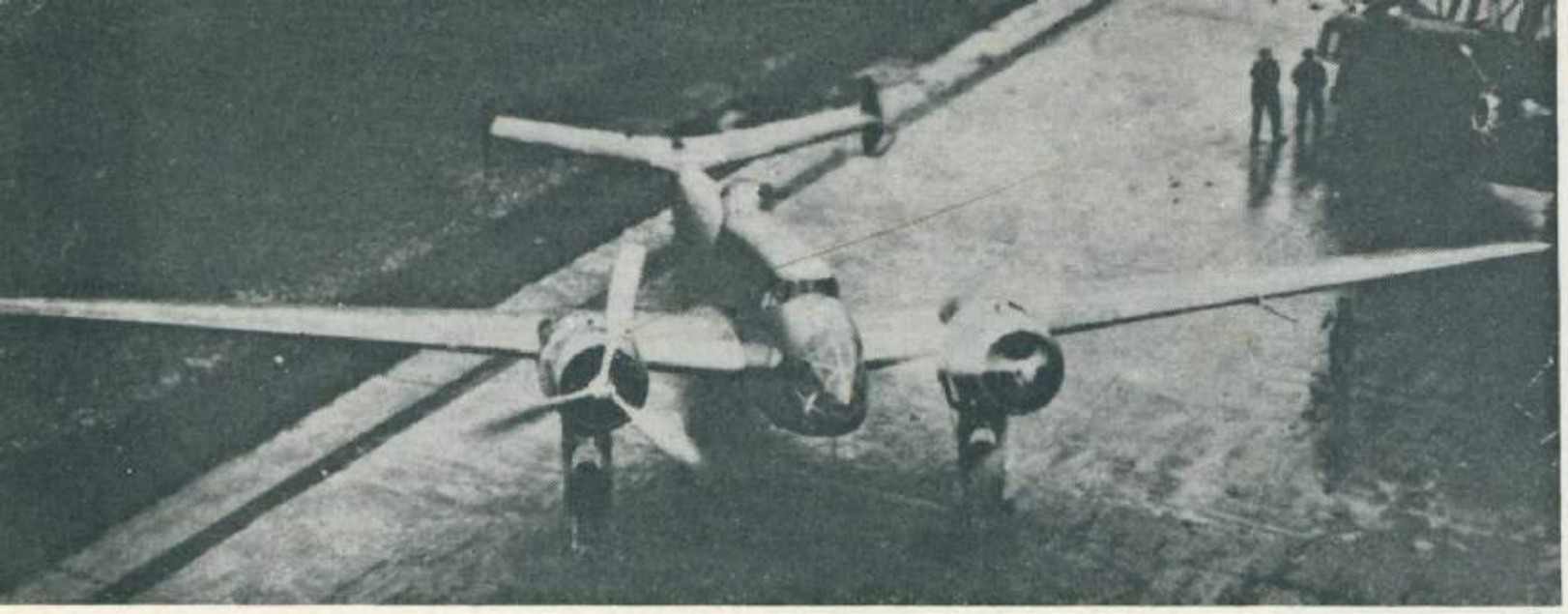
When the French Air Force officially became an independent arm on 1st April 1933, apart from maintaining its classical task of co-operation with land and naval forces, it was required to perform strategic operations. Existing aircraft were unable to carry out such a task and a modernisation scheme, known as Plan I, was inaugurated. Plan I called for 1,010 modern warplanes to be in first-line service by late 1936, and among these were 350 bombers; 210 were to be medium, 120 heavy and 20 (four-engined) very heavy bombers. Further, there were to be 310 twin-engined multi-seat army co-operation aircraft capable of usefully participating in land battles.

The Bloch M.B. 200 and 210, Amiot 143, LeO 257 *bis*, Potez 540 and 542, Farman 221 and 222 bombers and B.C.R. (*Bombardement*, *Combat*, *Renseignements*) multi-seaters that were ordered between 1933 and 1935 were developments of technical programmes that originated five years earlier. Widely inspired by the theories of the Italian General Douhet, these machines were considered as "flying cruisers", strongly protected by several machine-gun turrets without any undefended sector. It quickly became obvious that their armament was quite ineffective; the aircraft were insufficiently manoeuvrable and too slow, and hence too vulnerable to perform strategic sorties by day without suffering unbearably heavy losses over enemy territory.

To expedite their replacement, a new programme for B5 (five-place bomber) heavy aircraft was established on the 17th November 1934 by the S.T.Aé. (*Service Technique Aéronautique*) and addressed to the main French aircraft manufacturers. In order to achieve a maximum speed of at least 400 km/h. (249 m.p.h.) at 4,000 m. (13,123 ft.), it was recommended that there be no movable forward-firing turret, to reduce drag. The forward-firing guns were to be mounted in the fuselage, the rearward-firing dorsal and ventral flexible weapons were to be carefully faired and the bomb-load was to be housed internally. The normal bomb-load was to be 1 tonne (2,204 lb.) but for a shorter range of 900 km. (559 ml.), a bomb-load of 1·5 tonnes (3,306 lb.) was required. The new bombers were to be operated by night or day



Three LeO 451 bombers of 1st Escadrille, *G.B.I/25, based in Tunisia in 1941, seen in flight. Note the unit insignia is shown on both the forward fuselage and the tail unit.* (Photo: E.C.A.)



Two views of the first prototype, the LeO 45-01, at Villacoublay early in 1937. The biplane in the background of the upper photograph is a LeO 20 Bn3 night bomber. (Photos: Sud-Aviation)

at 4,000 m. (13,123 ft.) medium altitude, provided that they were covered by escorting fighters.

Late in 1935, mock-ups of the preliminary proposals (the Amiot 341, Latecoere 570, Romano 120, Lioré et Olivier 45 and the Bloch 134) were presented to the S.T.Aé. As a result of their evaluation it was decided to entrust rearward defence to a 20 mm. Hispano-Suiza cannon firing through a twin-finned tailplane, whereas the lower flexible machine-gun was to be enclosed within a fully retractable "tub". The crew was also reduced from five to four as it was considered that the co-pilot could also be used as a navigator and bomb-aimer. The proposals for the programme were then redesignated B4 medium-bombers.

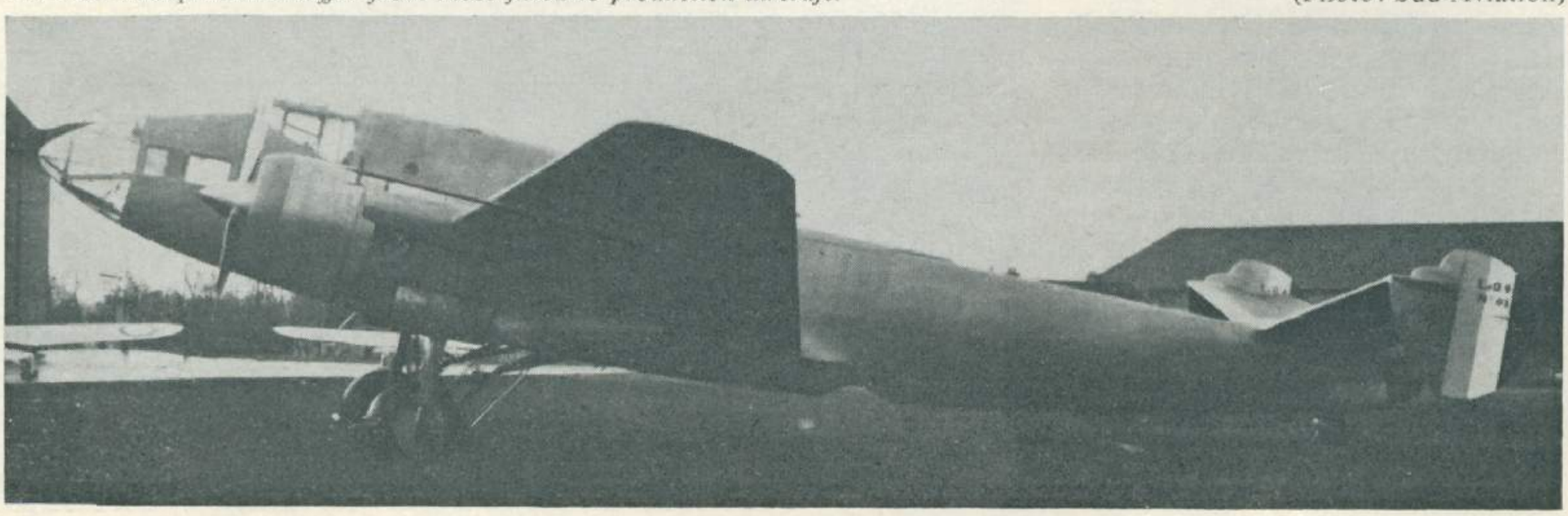
In September 1936, at which time fast twin-engined bombers such as the Bristol Blenheim (see *Profile* No. 93) and the Fiat BR.20 (see *Profile* No. 110) had already flown abroad, powerful engines capable of developing 1,000 h.p. were being developed in France by Hispano-Suiza and Gnome-Rhône. This, and other technical improvements likely to be introduced, resulted in the S.T.Aé. issuing an amendment to the B4 specification calling for a maximum speed of 470 km./h. (292 m.p.h.) at altitude instead of the original 400 km./h. At this same period, Plan I and the five-year scheme which followed it on 25th August 1936 were cancelled by the advent of Plan II. The *Armée de l'Air* bomber force was to be further increased, the new scheme calling for 41 B4 units each to be 12 aircraft strong, supported by a similar quantity held in reserve; thus a total of 984 medium bombers was to be manufactured.

THE PROTOTYPE LeO 45-01

The prototype LeO 45 B4 No. 01 was manufactured by the Argenteuil plant and transferred to Villacoublay airfield for final assembly, being ready somewhat earlier than its rivals which were also the subjects of prototype orders. It was fitted with Hispano-Suiza 14 AA 06/07 engines enclosed by conventional N.A.C.A. cowlings and driving three-bladed Hispano-Suiza (Hamilton-license) airscrews the pitch of which could be set in two positions in flight. The Hispano-Suiza 14 was a 14 cylinder, air-cooled double-row radial developing 980 h.p. at sea-level, 1,080 h.p. at take-off (with 960 mm. Hg boost), and 1,120 h.p. at 4,000 m. (13,123 ft.).

The structure of the LeO 45 was designed to permit the installation of the 1,200 h.p. Gnome-Rhône 14P at a later date without any major modification, and with which a maximum speed of 515 km./h. (321 m.p.h.) was estimated.

The LeO 45-01 seen in mid-1937 after modifications to the fins and rudders and the fitting of extended air intakes to the oil coolers. The nose transparencies differ from those fitted to production aircraft. (Photo: Sud-Aviation)

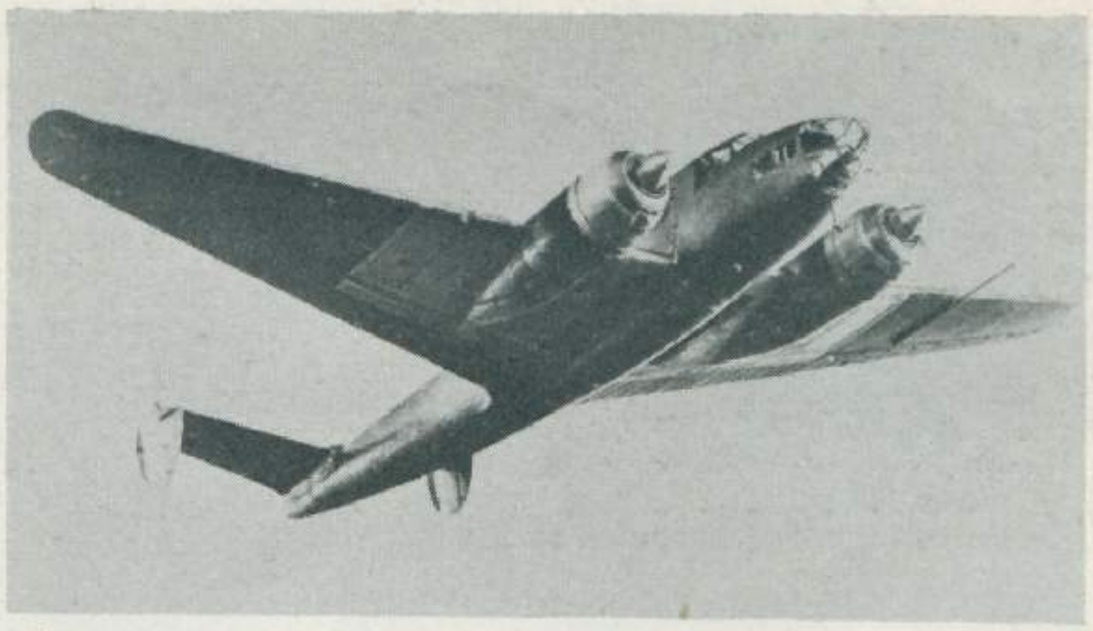


The maiden flight of the LeO 45-01 took place on the 16th January 1937 at Villacoublay. It was immediately apparent that the area of the vertical tail surfaces was inadequate at the take-off and during the climb. This instability was partially cured by using wholly redesigned twin fins and rudders deeper than the originals. The increased area incorporated an aerodynamic balance shutter in the upper part of the rudder.

At this stage, on the 20th February 1937, the Argenteuil plant was nationalised and incorporated into the S.N.C.A.S.E. (*Société Nationale de Constructions Aéronautiques du Sud-Est*). S.N.C.A.S.E. had been formed on the previous 1st February by the amalgamation of various private plants at Berre (Potez), Vitrolles (C.A.M.S.), Cannes (Romano), and Marseille-Marignane (S.P.C.A.).

During initial flight testing of the LeO 45, considerable trouble was encountered with the engines which apparently needed to be changed after every 18 hours flying. The oil coolers, located in the leading edge of the wings, required provision with faired air intakes to increase efficiency and thus reduce engine overheating. Nevertheless an excellent performance was achieved, maximum level speed being 480 km./h. (298 m.p.h.) at 4,000 m. In a slight dive, starting from a level speed of 464 km./h. (288 m.p.h.) at 5,000 m. (16,404 ft.), the LeO 45 attained 624 km./h. (388 m.p.h.) at 1,800 m. (5,900 ft.).

The prototype was delivered to the C.E.M.A. (*Centre d'Essais des Matériels Aériens*) at Villacoublay in September 1937 for official evaluation. On 6th December the manufacturer's test pilot Jean Doumerc was compelled to force-land the prototype in a ploughed field after both engines failed simultaneously. Thanks to the pilot's skill the machine remained undamaged, coming to a halt after a landing-run of 150 metres (492 feet).

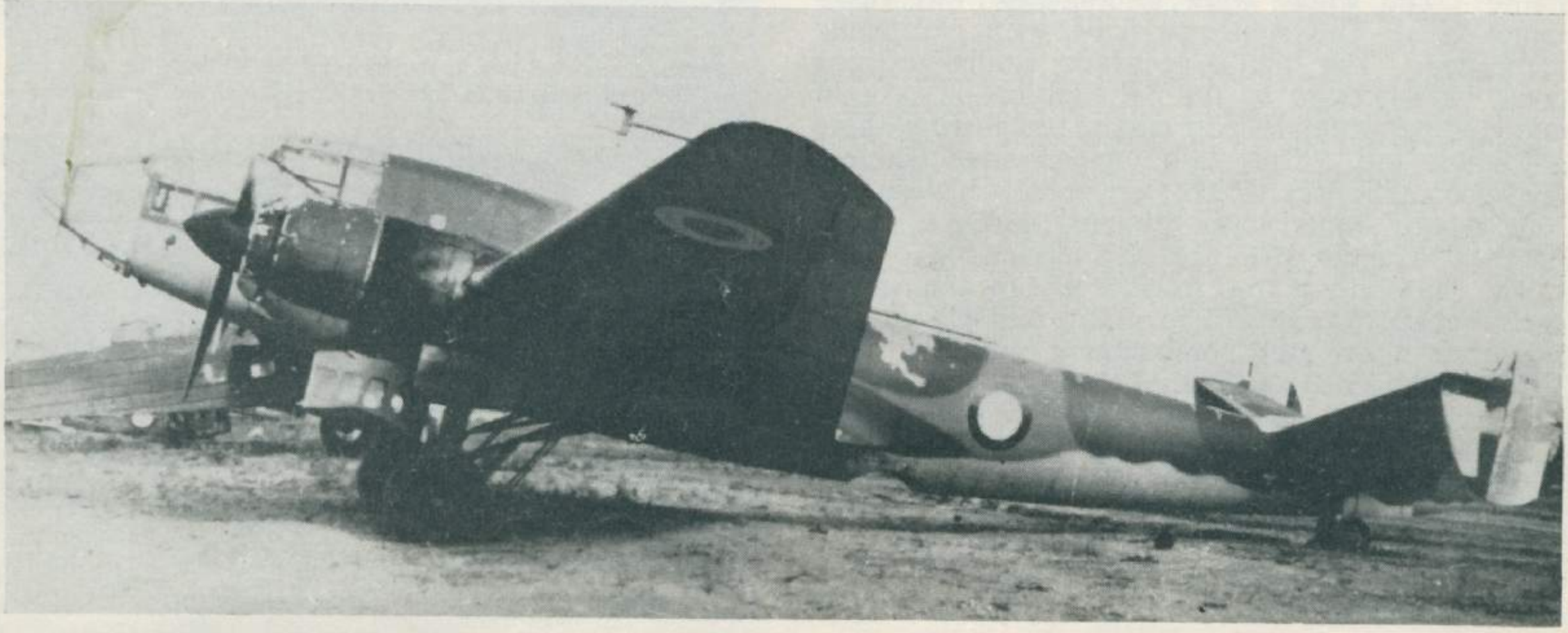


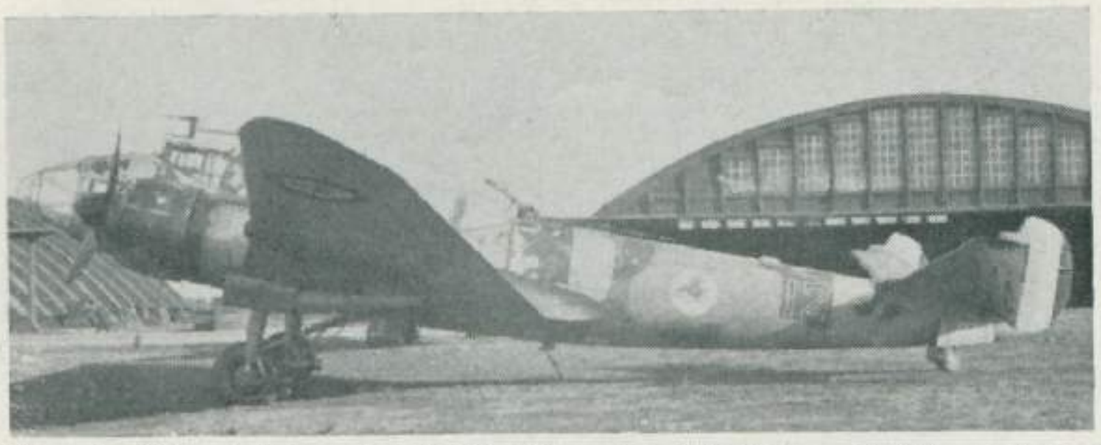
The prototype in its final form, redesignation LeO 451-01, fitted with Gnome-Rhône 14N radials enclosed in beautifully streamlined Mercier cowlings. (Photo: Sud-Aviation)

The prototype was returned to the manufacturer after evaluation and fitted with special engine cowlings designed by the S.N.C.A.S.E. chief engineer, Mercier. These had already been successfully tested on the prototype LeO H 46 floatplane. Their design allowed the engine oil to be more efficiently cooled with much less drag than the classic N.A.C.A. design. In further tests at C.E.M.A. in July 1938, a maximum speed of 500·2 km./h. (310 m.p.h.) was attained, this improvement being entirely due to the Mercier cowlings. On 29th August 1938 it was decided to abandon the Hispano-Suiza engines, since they still gave trouble and seemed likely to considerably delay the entry

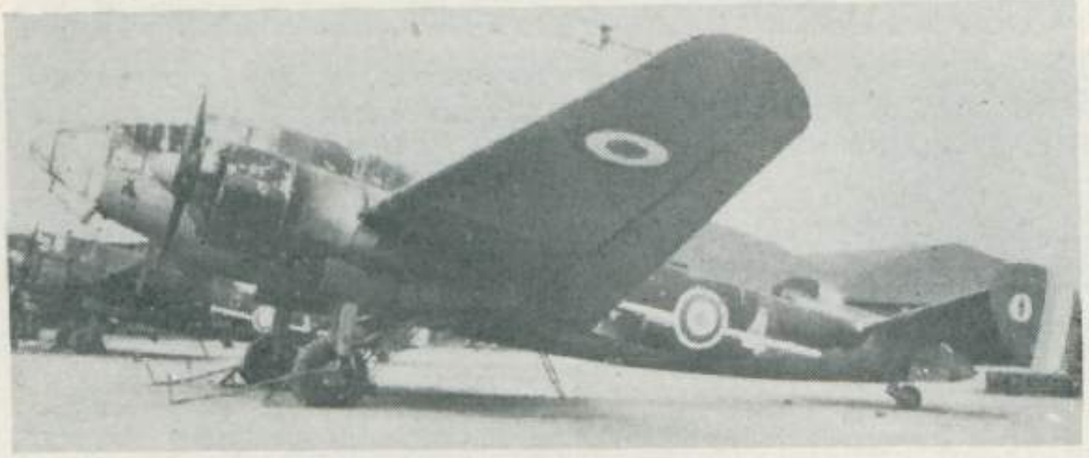
(Left) *A LeO 451*, matricule militaire *I-571, of G.B.I/12, late 1939, and* (right), *seen in May 1940 at Château-Bougon, a machine manufactured at Nantes-Bouguenais with the number 3005 chalked on the tailplane.*

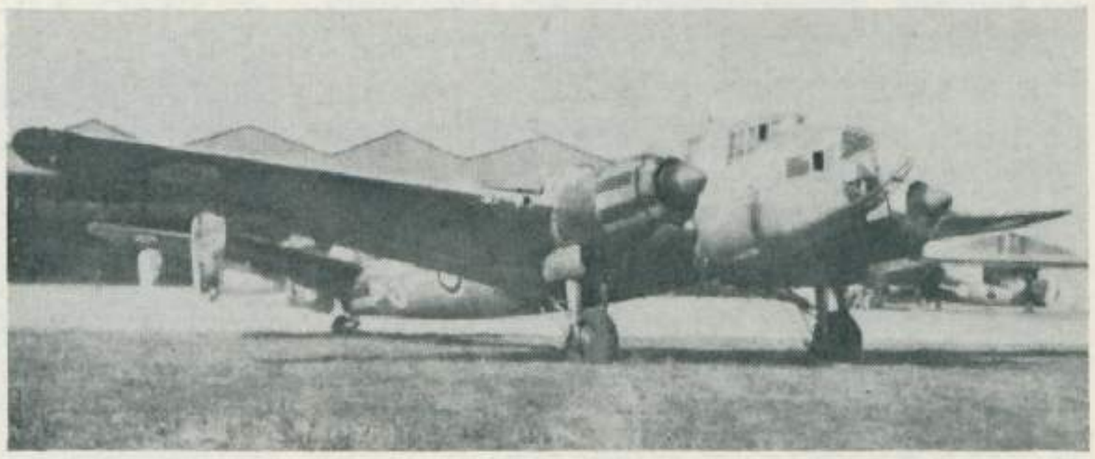
At the time of the Armistice many French aircraft had been withdrawn to southern France. This LeO 451 shows its extended ventral turret to advantage. In the background, an obsolete Bloch 200 bomber.





Two LeO's at Istres in 1940 after the Armistice, (left) *an aircraft of 1st* Escadrille, *G.B.II/31 with the fuselage roundel painted out and a unit insignia in its stead, and* (right) *one of G.B.I/12's aircraft showing the fairing for the fixed forward-firing machine-gun located on the starboard side beneath the cockpit.* (Photo: above: E.C.A.)





(Left) *LeO 451 No. 378 of 1st* Escadrille, *G.B.I/11 at Oran-La Sénia in the summer of 1941.* (Right) *An aircraft of 1st* Escadrille, *G.B.II/23 based at Meknès in 1942.*

into service of the LeO 45. On this date, the prototype had made 37 flights totalling 66 hours 45 minutes in the air.

The prototype was re-equipped with Gnome-Rhône 14 N 20/21 engines enclosed in Mercier cowlings, developing 1,030 h.p. at 5,000 m. (16,404 ft.), and the machine was redesignated LeO 451-01. The flight test programme was resumed from 21st October 1938 until February 1939, and in spite of the slightly less powerful engines the speed and general performance remained unchanged.

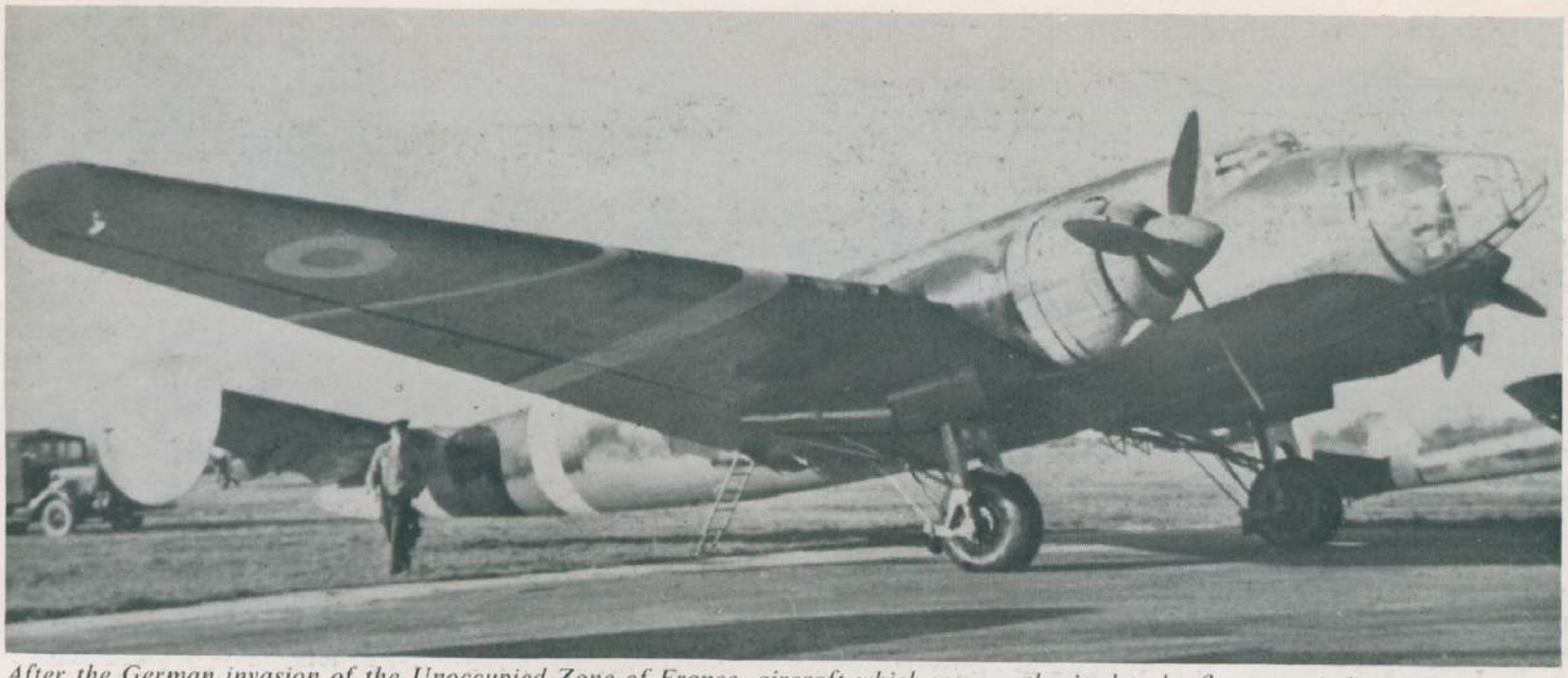
THE STRUCTURE OF THE LeO 45

The low cantilever wing consisted of four sections: a centre section in two halves and two outer panels attached outboard of the engine nacelles. The centre section included two spars with steel booms and light alloy webs, the space between the spars being used for fuel tanks with a capacity of 1,810 litres (398 Imp. Gall.). In each wing two auxiliary fuel tanks, the forward ones of 610 litres (134 Imp. Gall.) capacity and the rear ones of 815 litres (179 Imp. Gall.), gave a total fuel capacity of 3,235 litres (712 Imp. Gall.). Wing root bomb-bays could each accommodate one 100 kg. (220 lb.) or 200 kg. (440 lb.) bomb. The whole wing leading-edge was easily removable. The split-type flaps were electrically controlled. The high aspect-ratio slotted ailerons could be depressed by the pilot for use in take-off and landing, while the port aileron was fitted with an adjustable tab. The main undercarriage featured oleo-pneumatic legs which were totally enclosed by four shaped doors when retracted into the engine nacelles. The tail wheel was also retractable.

The elliptically-shaped fuselage was of monocoque construction and featured an almost fully-glazed nose for observation and bomb-aiming purposes. Its structure included 60 frames fixed to longitudinal stringers, the whole being covered by flush-riveted light alloy panels. The main bomb-load, enclosed in a central bomb-bay, varied according to the target proximity and the amount of fuel being carried. The maximum bomb-load consisted of two 500 kg. (1,100 lb.) and five 200 kg. (440 lb.) bombs, although this limited fuel capacity to 1,000 litres (220 Imp. Gall.). A flexibly-mounted cannon and machine-gun were provided for rear defence and a fixed forward-firing machine-gun, with 300 rounds of ammunition, was located on the starboard side of the forward fuselage and operated by the pilot.

The horizontal tail surfaces, each plane having 13° dihedral, were built in two separate halves and mounted on a short central section bolted onto the top of the fuselage. The twin fins and rudders were attached at the extremities of the tailplane; the rudders and elevators were fitted with trim tabs.

Two scenes from Ambérieu, 1942, (above) *LeO 451's being overhauled and* (below), *a machine of 2nd* Escadrille, *G.B.I/38 (note the unit insignia and the single yellow stripe on the engine cowling).* (Photos: E.C.A.)



After the German invasion of the Unoccupied Zone of France, aircraft which were authorised to be flown carried civil registrations and had white bands painted on the wings and fuselage. The civil registration letter F- can just be seen in this photograph.

PRE-WAR PRODUCTION ORDERS

A first pre-production order was signed in May 1937 for one LeO 450, to be fitted with Hispano-Suiza 14 AA 06/07 engines, and one LeO 452 powered by 1,150 h.p. Hispano-Suiza 14 AA 12/13 engines.

On 29th November 1937 a second order, No. 51/8, called for 20 production machines, the first of these being scheduled for delivery in May 1938. 20 further LeO 45's were ordered under contract No. 361/8, dated 26th March 1938. This order closely followed the adoption of "Plan V" by the French Air Ministry, this new scheme including proposals for 22 medium bomber units to be re-equipped with modern aircraft. To meet this programme 449 B4 bombers, including 185 reserve aircraft, were to be in the hands of the *Armée de l'Air* in April 1940. Apart from the LeO 45, official contracts also included 140 stop-gap Bloch 131 and an unspecified quantity of Amiot 350 derivatives,

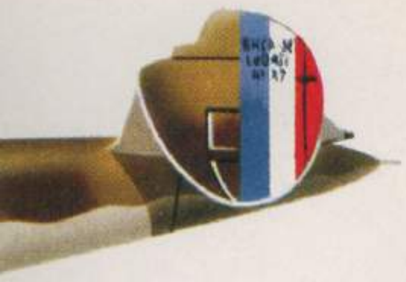
(Above) *A German photograph of a LeO 451 in Southern France, November 1942 showing the open fuselage bomb-bay doors.* (Photo: via H. J. Nowarra). (Below) Luftwaffe-*operated LeO 451's at a base in southern France: the machine in the background still carries Vichy markings.*

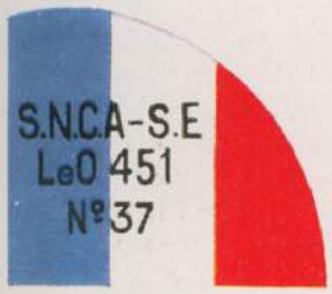
to be ordered as soon as the type was fully developed. Nevertheless, 100 additional LeO 45's were ordered on 15th June 1938 by contract No. 747/8, and the S.N.C.A.S.E. was requested to prepare for a further possible order of 100 aircraft.

On 21st October 1938, following successful tests with Gnome-Rhône engines in the first prototype, all production machines were required to be powered by Gnome-Rhône engines in place of the original Hispano-Suiza type. These aircraft were then re-designated LeO 451, to be fitted with Gnome-Rhône 14 N 38/39 or 48/49 engines indiscriminately. This decision considerably delayed delivery of the first LeO 451; indeed LeO 451-1, which had been displayed at the Paris Air Show in late November 1938, did not fly until 24th March 1939. Under its wings was painted in white the *matricule militaire* I-537. (A military registration for long-distance identification, the *matricule militaire* served to identify an individual aircraft and not a unit or formation. The marking was allocated at the factory and a production run had successive registrations, e.g. I-539 for No. 3, I-550 for No. 14, etc. The system was discontinued after about 150 LeO 451's had been produced.) No. 2, first flown on 28th April 1939, was tested with two 14 N 39 engines, both propellers rotating in the same direction; production aircraft featured counter-rotating propellers to eliminate torque effects.

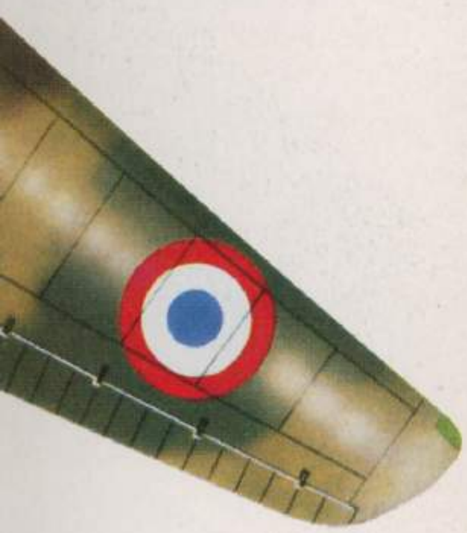
Production of Gnome-Rhône airscrews was even slower than that of Gnome-Rhône engines and did not even satisfy the priority programme for the Bloch 151/2 series. It was decided to fit the LeO 451 engines with 1634/1635 Ratier airscrews intended originally for the similarly-powered Amiot 351 and 354 B4 bombers. Of smaller diameter than the Gnome-Rhône ones, the Ratier airscrews gave their maximum output at 2,200 r.p.m., whereas the engine's nominal figure was 2,400 r.p.m.; accordingly maximum speed was reduced from 500 km./h. (311 m.p.h.) to 480 km./h. (298 m.p.h.).

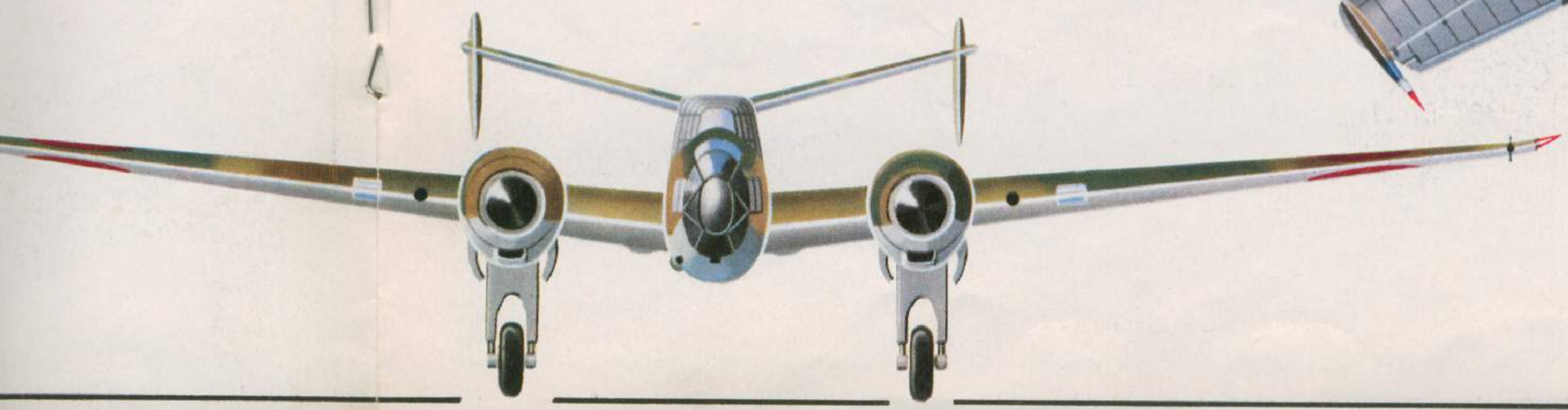
Early in 1939, as the international situation was steadily worsening, the initial requirements of Plan V were increased to 1,188 B4 bombers; among these 396 were to be first-line aircraft. On the 20th February 1939 the tentative order for 100 aircraft was confirmed by contract No. 294/9 and that was

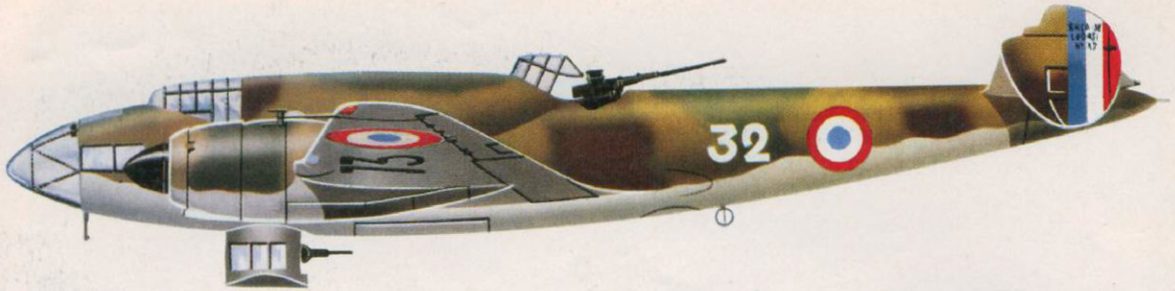




LIORE ET OLIVIER LeO 451, No. 37, flown by *Sergent-Chef* Servais of G.B.II/12. This aircraft was shot down during an attack on a German armoured column on 20th May 1940 at Origny-Sainte Benoite, France; the crew of four (Servais, *Adjutant-Chef* Michelet, *Adjutant* Augé and *Sergent-Chef* Roques) were killed.

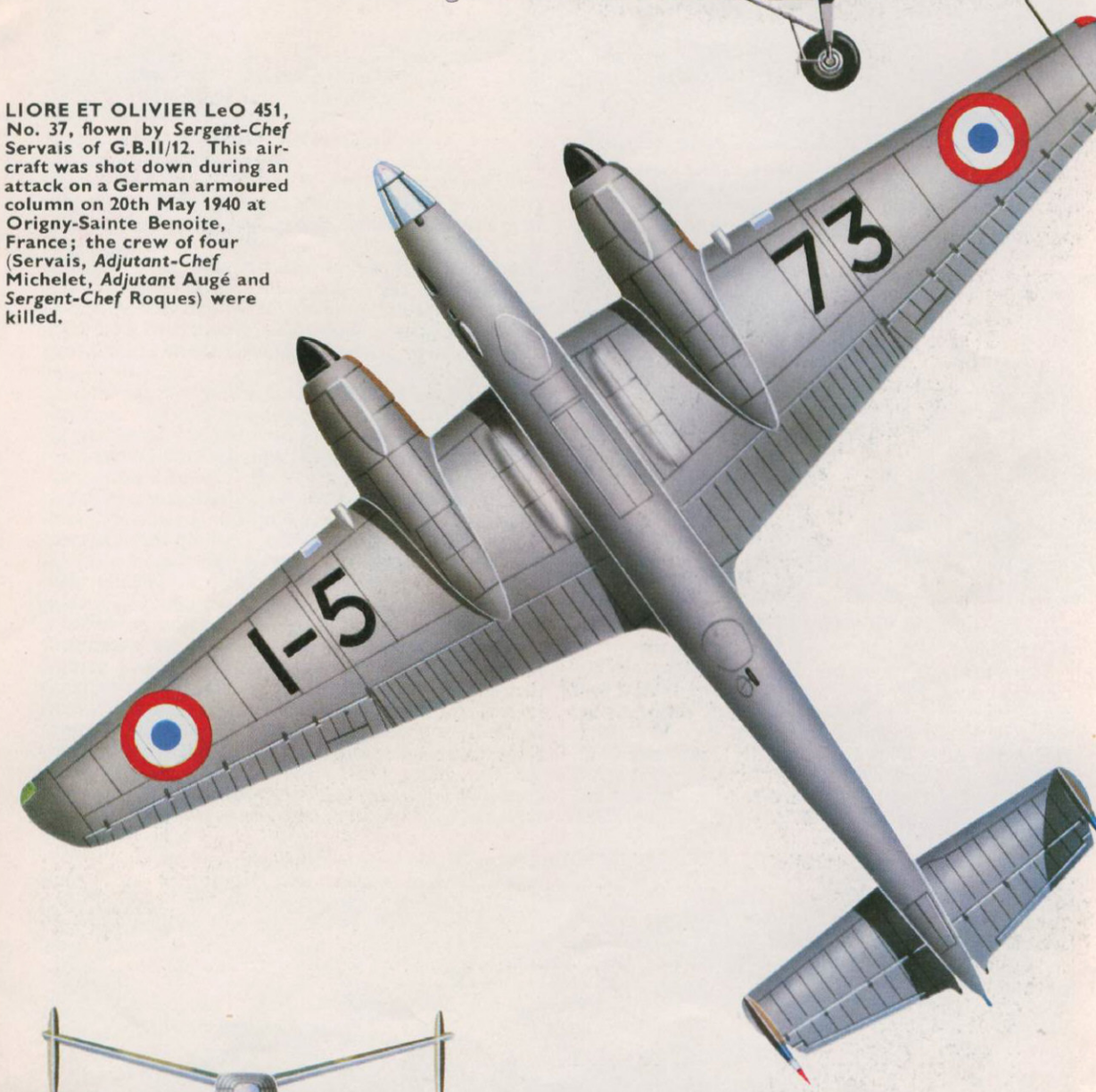


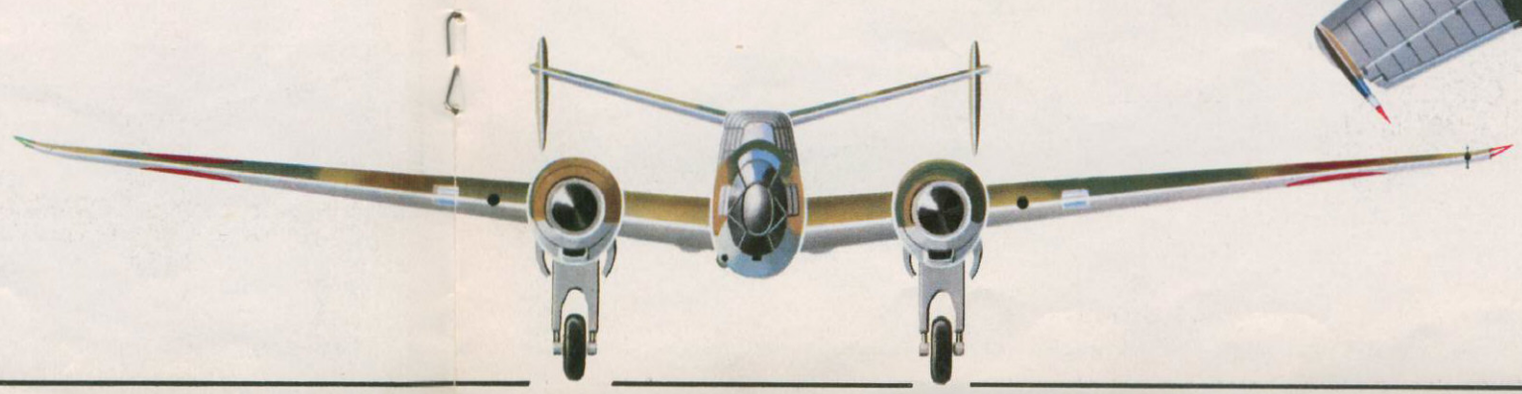


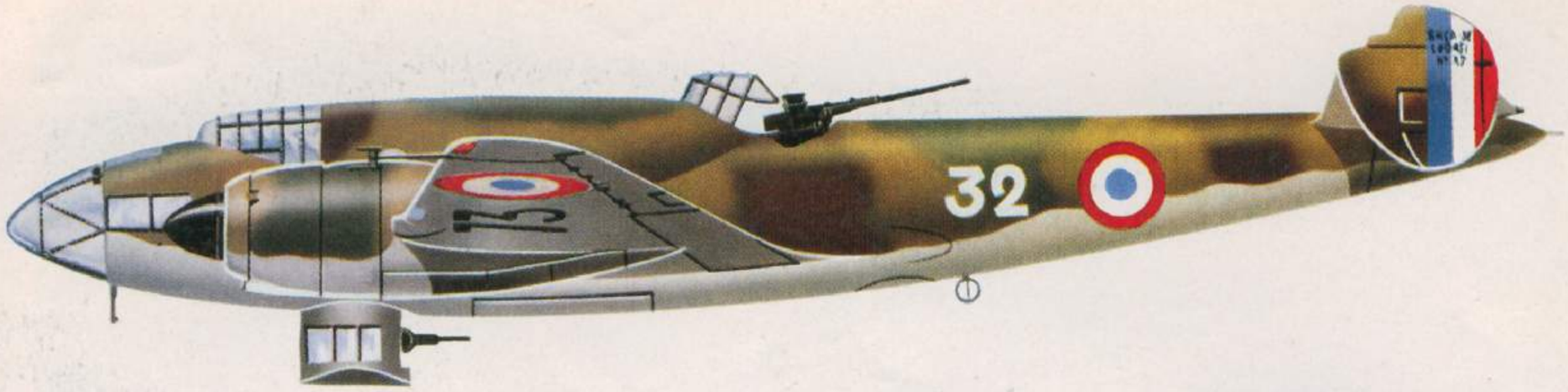


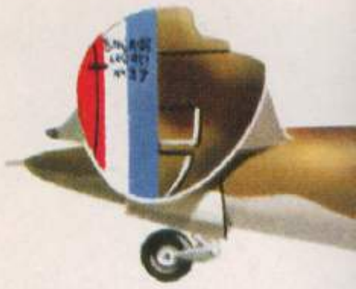
© JAMES GOULDING

LIORE ET OLIVIER LeO 451, No. 37, flown by *Sergent-Chef* Servais of G.B.II/12. This aircraft was shot down during an attack on a German armoured column on 20th May 1940 at Origny-Sainte Benoite, France; the crew of four (Servais, *Adjutant-Chef* Michelet, *Adjutant* Augé and *Sergent-Chef* Roques) were killed.

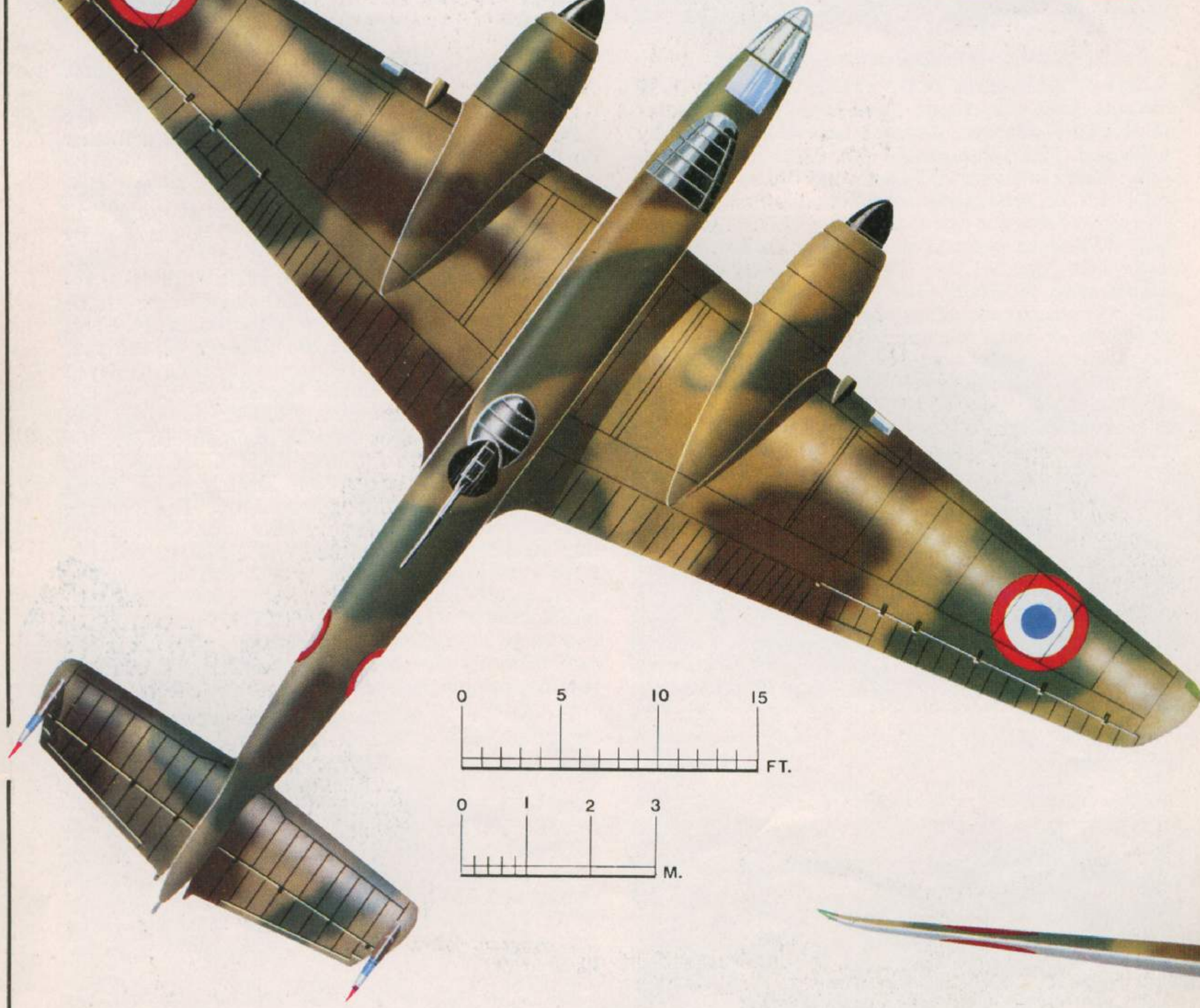


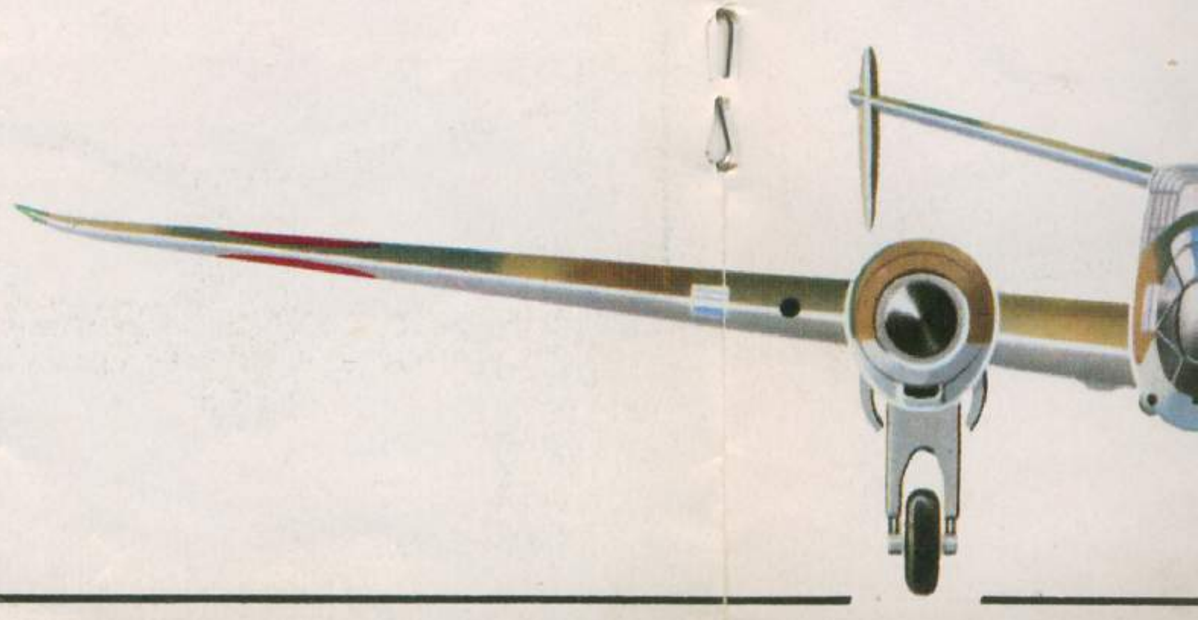






LIORE ET OLIVIER LeO
No. 37, flown by *Sergent*-
Servais of G.B.II/12. This
craft was shot down durin
attack on a German armo
column on 20th May 1940
Origny-Sainte Benoite,
France; the crew of four
(Servais, *Adjutant-Chef*
Michelet, *Adjutant* Augé a
Sergent-Chef Roques) wer
killed.





© JAMES GOULDING

Seen in North Africa in 1943 after the Allied landings are (above) *a LeO 451 of G.B.I/25 during the campaign in Tunisia,* (*note the C-47 Dakota in the background*), *and* (below) *LeO 451 No. 318 of the C.I.B., Marrakesh, carrying the legend* "LE SEN-AIS" *on the fuselage side.* (Photo: E.C.A.)

followed on 18th April by No. 919/9 for a further 480 machines.

Three LeO 451's took part in the Brussels-Evère air meeting on 9th July 1939, and eight were flown a few days later over Paris for the Bastille Day celebrations, although at the time only two (No. 7 on 29th, and No. 3 on 31st July) had officially been taken on charge by the French Air Force. Early in August, an evaluation flight (*escadrille d'expérimentation*) was set up at the Rheims C.E.A.M. (*Centre d'Expériences Aériennes Militaires*) with five LeO 451's and crews from the Bloch 200-equipped G.B. (*Groupe de bombardement*) I/31 stationed at Tours.

LeO 45 orders totalled 749 at the outbreak of war, including five LeO 457's, a projected and ultimately still-born high-altitude version, ten LeO 458's to be fitted with American-built Wright GR-2600-A5B double-row engines driving Hamilton Hydromatic airscrews, and twelve LeO 451's, ordered in March 1939 by Greece but later retained by the French government.

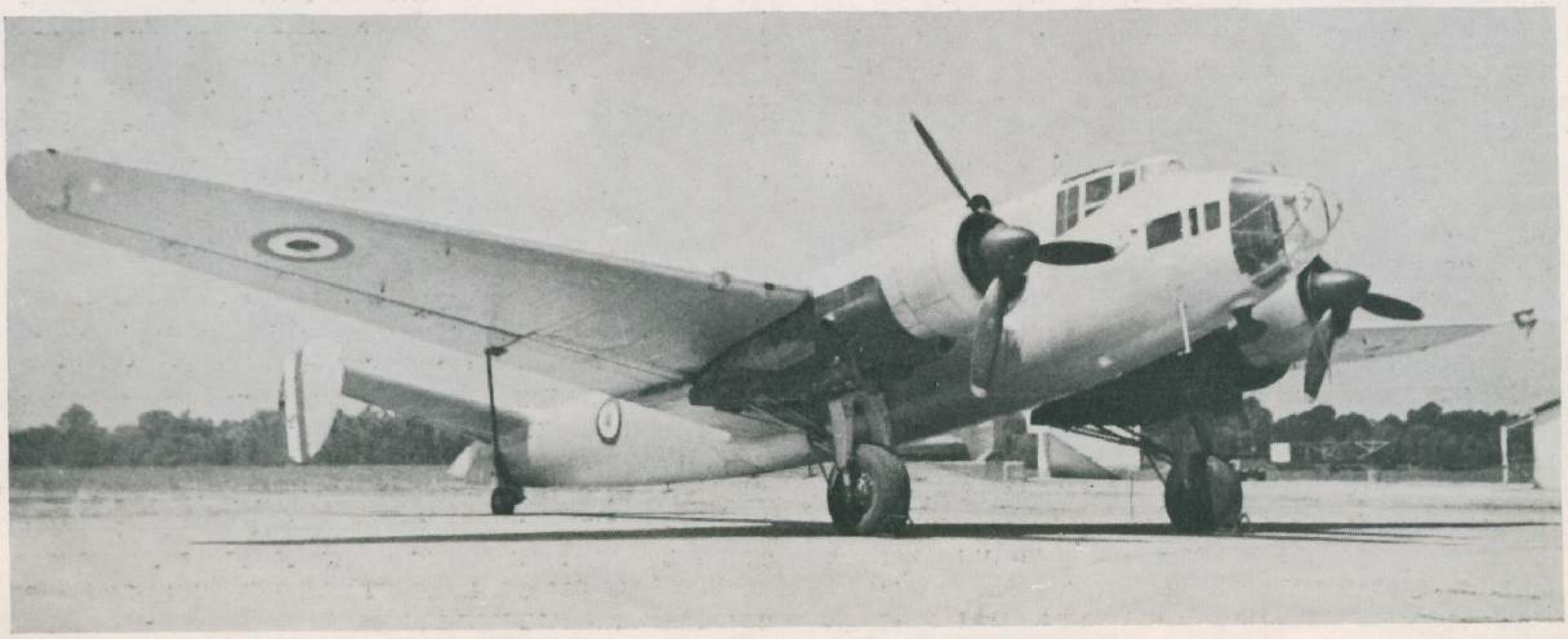
At this time, only ten LeO 451's (Nos. 3 to 10, 12 and 15) were on French Air Force charge, although 22 had been delivered by the assembly plant.

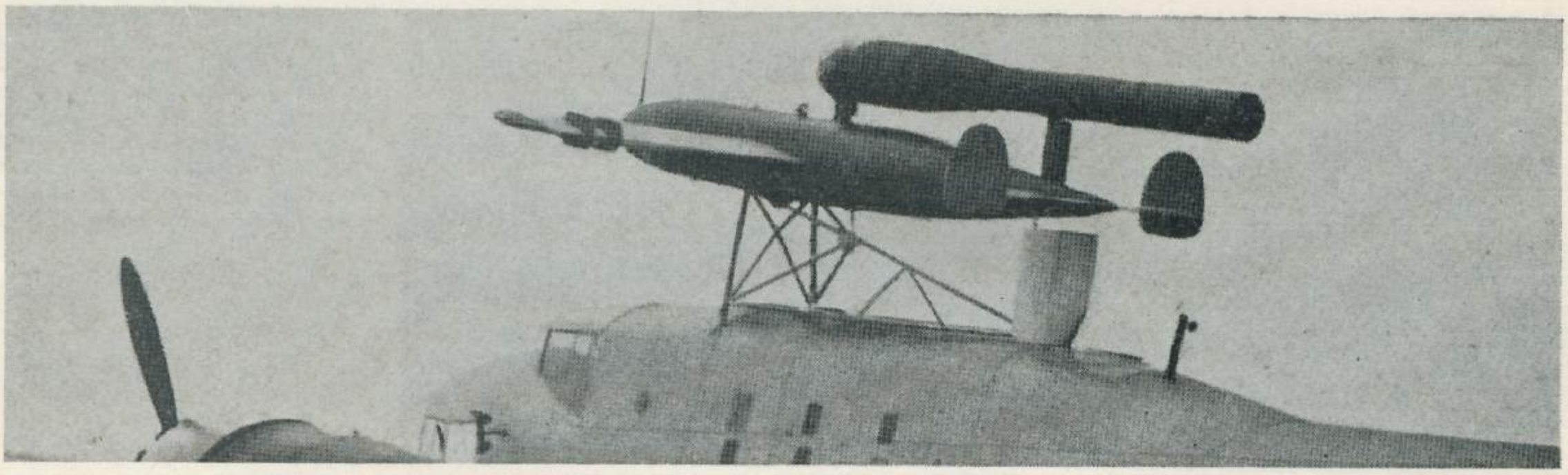
THE "PHONEY WAR" PERIOD

Further production orders followed the outbreak of war in September 1939. The S.N.C.A.O. had almost completed a large order for the M.S.406 (see *Profile* No. 147), and on 12th September 1939, the organisation received contract No. 1969/9 for 200 LeO 451 aircraft, whose serials were to start at No. 3001. Furthermore the *Aéronavale*, having successfully tested the prototype LeO 451M (M for *Marine*), earlier designated LeO 456, ordered 68 standard LeO 451's to be delivered between June and November 1940.

Altogether, orders for LeO 45 derivatives amounted to 1,549, including 400 LeO 455's (to be fitted with Gnone-Rhône 14R two-speed supercharged engines developing 1,375 h.p. at 2,600 metres = 8,530 ft.), and 200 LeO 458's, 120 of these to be fitted with long-nosed Wright engines driving Curtiss airscrews. Thirty-three major sub-contractors were already participating in the LeO 45 programme, among them Breguet at Vélizy producing outer wings and the S.I.P.A. plants at Asnières, Neuilly and Nantes producing wing centre-sections. Further assembly lines were set up to boost the production rate. The Ambérieu S.N.C.A.S.E. plant assembled its first machine (No. 11) from components manufactured by the Clichy and Levallois factories, and its second (No. 30) from components sub-contracted in the Lyons Saint-Etienne area. These aircraft were respectively taken on charge on 12th October and 5th November 1939. Later on, a third line was established at the Marseilles-Marignane plant, its first machine reaching the *Armée de l'Air* on 3rd

A LeO 453 communications aircraft of G.L.A.45 seen at Rabat, Tunisia, in 1947.





The LeO 451E was used for air-launching various special weapons, including the S.F.E.C.M.A.S. Arsenal 5501 seen here.

May 1940, at which time the S.N.C.A.O. Nantes-Bougenais line began deliveries.

G.B.I/31, equipped with five LeO 451's and eight Bloch 200 aircraft and based at Connantre flew day strategic reconnaissance sorties for the 6th D.Aé. (*Division Aérienne*). One aircraft was destroyed in an accident in September; and on 6th October LeO 451 No. 6 was shot down in flames by "flak" in the Euskirchen area of Germany, having previously been heavily damaged in two successive Bf 109 attacks.

In order to allow them to transfer to modern machines, all bomber units except those flying Amiot 143 or Farman 221/222 aircraft were withdrawn from operations and allotted to the G.I.A.B.S.E. (*Groupement d'Instruction d'Aviation de Bombardement du Sud-Est*) created at Avignon on 4th December 1939. G.B.I/12 at Auzainvilliers and G.B.II/12 at Damblain retired to Orléans-Bricy on 7th September to exchange their Bloch 210 machines for the LeO 451, and received their first aircraft on 13th September and 6th October respectively. They moved to Caën-Carpiquet, Orange and finally to Salon-de-Provence on 13th December. Two days earlier G.B.I/31 joined the Bloch 200-equipped G.B.II/31 at Lézignan. G.B.I. and II/32 (Bloch 200) were at Orange-Plan de Dieu, G.B.I and II/11 (Bloch 210) were at Mas de Rue, whereas G.B.I and II/23 had moved from Istres to Le Vallon. All these ten *Groupes de Bombardement* were to become operational with the LeO 451 by late February 1940, at which time they were to have on strength 27 aircraft within the two *Groupes* forming an *Escadre*.

This estimate was far from being fulfilled, for the delivery of the type to the units was delayed by modifications required before it could be put into service. Modification lines had to be established apart from the assembly lines in order that these should not be blocked.

On 10th March 1940, out of 106 LeO 451's on *Armée de l'Air* charge, 59 had reached the bomber units, and 31 of these were immediately available. Three were at the 11th *Escadre*, 36 at the 12th, five at the 23rd, ten at the 11th, and five at the 32nd *Escadre*.

Some accidents had been caused during training by the difficult handling qualities of the LeO 451 at take-off; three machines (Nos. 1, 16 and 32) were thus rapidly written off the strength of the 12th *Escadre*. In order to overcome this problem, piloting demonstration courses took place at each unit with the S.N.C.A.S.E. chief test pilot Capitaine Jacques Lecarme as an instructor. This proved an excellent remedy, take-off accidents being subsequently almost entirely eliminated.

In mid-April, the 32nd *Escadre* relinquished its LeO 45's and moved to Marrakesh (Morocco) to be re-equipped with the American-built Douglas DB 7 bomber.

THE FRENCH BOMBER FORCE ON 10th MAY 1940

At the time when the Germans launched their *Blitzkrieg* offensive, the disposition of the whole French bomber force was as follows:

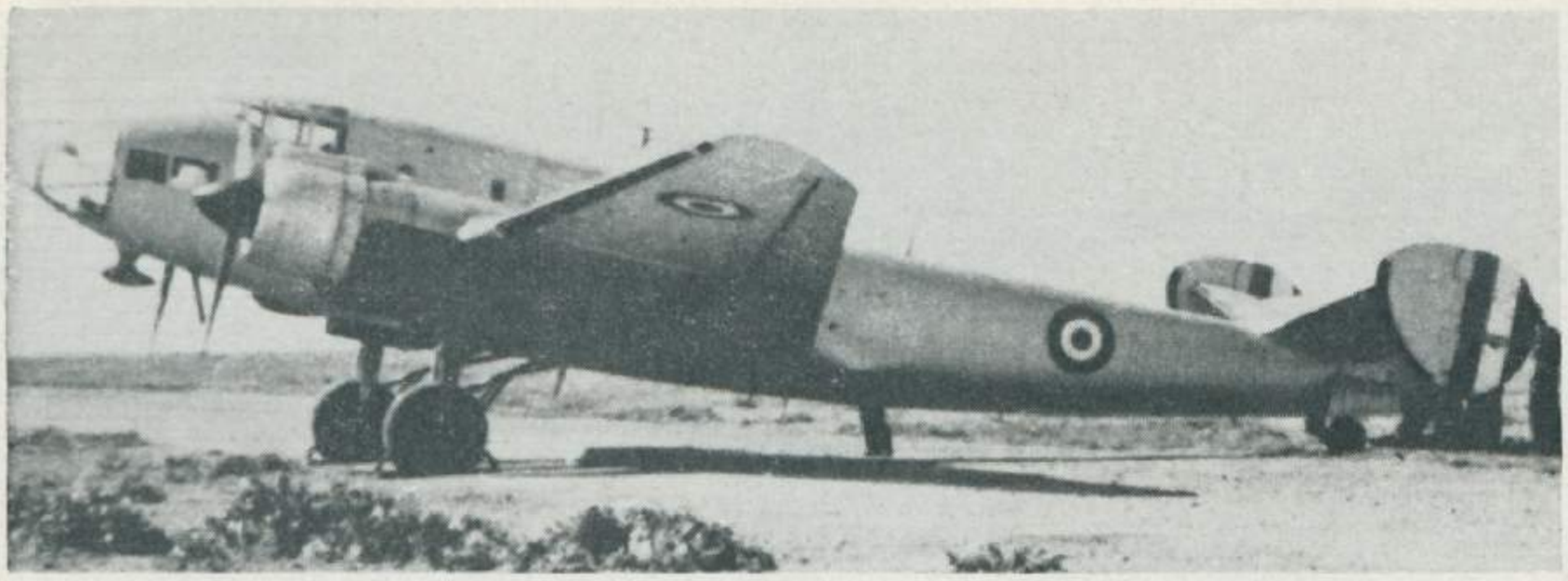
Altogether there were 33 bomber units, two heavy, 16 medium, ten light and five assault *Groupes*. Twenty-three were stationed in the homeland, nine in North Africa (among these were two with no aircraft: G.B.I/32 and II/32), and one in Syria. The 23 home-based units comprised two B5 heavy *Groupes* (Farman 221 and 222), two B3 light *Groupes* (American-built Glenn Martin 167F), five AB2 assault *Groupes* (Breguet 691 and 693, Potez 633), and 14 medium B4 *Groupes*. Only three of these B4 units was wholly equipped with the LeO 45 (G.B.I/12, II/12 and I/31), whereas G.B.I/11, II/11, I/23, II/23 and II/31 were transferring to the LeO 45 and partially retained the obsolete Bloch 210.

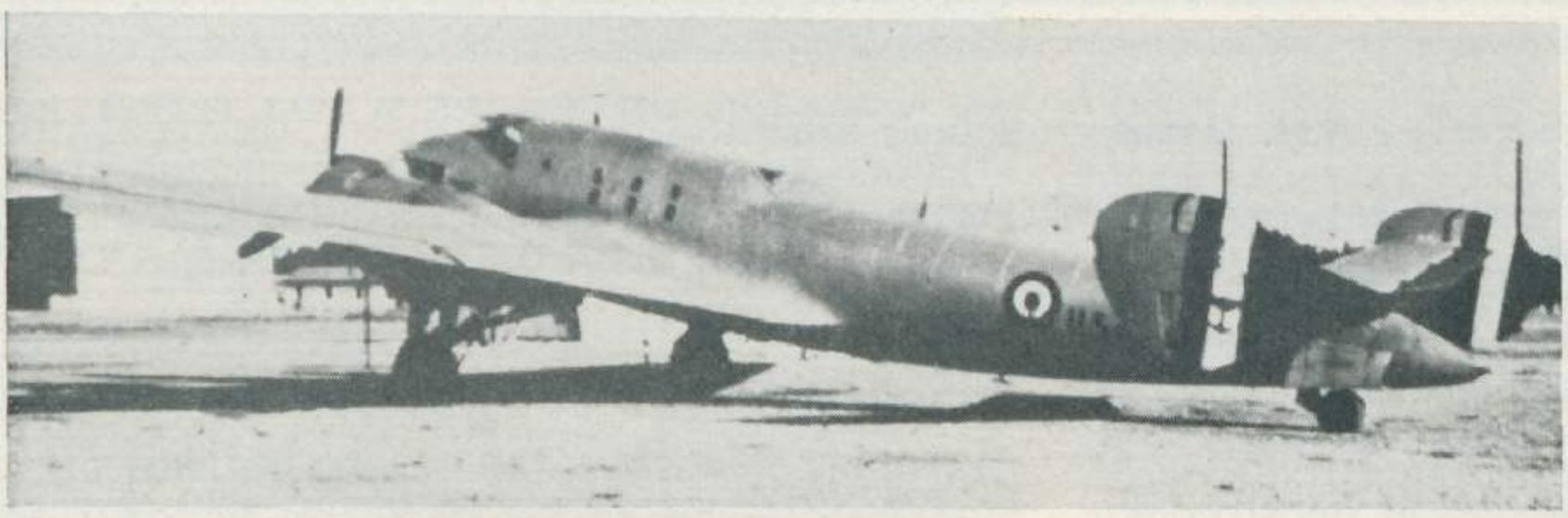
On 10th May 1940, the *Armée de l'Air* had had a total of 222 LeO 451's on charge; seven of these had been written-off, 94 (54 serviceable) were in the ranks of the homeland *Groupes de Bombardement*. Twenty-two were in reserve, twelve were with training units, and the remainder were undergoing modification or repair.

Of the 33 bomber *Groupes*, only 14 could be placed on an immediate operational footing; four of these were based in North Africa. The ten G.B.'s available in France consisted of six flying obsolete types (Farman 221/222 and Amiot 143), so that the only modern bomber types were 26 Breguet 693 of G.B.A. I/54 and II/54 and 26 LeO 451 (14 serviceable) of G.B.I/12 and II/12 forming *Groupement 6*, respectively based at Soissons-Saconin and Persan-Beaumont.

THE MAY-JUNE 1940 CAMPAIGN

On 11th May, six machines of G.B.I/12 and four of G.B.II/12, covered at altitude by 18 M.S.406 fighters, flew their first operational sortie. The targets were motorised columns on the Maastricht-Tongres road and a bridge over the Albert Canal. The attack was carried out at 500 metres (1,640 ft.), each aircraft dropping its bombs through a flood of machine-gun and light "flak" fire. No 46 of G.B.II/12 was shot down by an enemy tank; and of the nine bullet-riddled LeO 451's that returned safely, only one was airworthy the following day.





(Above) *LeO 453 of S.A.S.M. 99 at Algiers-Maison Blanche during 1952. Note the pneumatic de-icing boots fitted to the wing and tailplane leading edges.* (Below) *LeO 453 No. 35 of the* Aéronavale SAR Escadrille *at Les Mureaux, late in 1951, coded* 11 S 4.

Groupement 6 was re-inforced on 15th May by ten aircraft of G.B.I/31, and later by eight of II/31, one of these being shot down in error by French A.A. guns.

On 19th May, the Persan-Beaumont airstrip, shared by G.B.I/12, II/12 and I/31, was heavily bombed by twelve Heinkel He 111 aircraft, several LeO 451's being damaged beyond repair. The following day six machines of II/31, supplemented by the only four that were available within the three other groups, were involved in the Peronne-Saint Quentin area. Four of them (Nos. 37, 95, 102 and 106) were shot down by German light "flak" and fighters.

On 21st May, having flown 140 sorties, dropped 120 tons of bombs, and lost 41 machines (16 over enemy-held territory), *Groupement 6* was withdrawn southwards to reform. G.B.I/12 and II/12 moved to Orléans, and G.B.I/31 and II/31 to Chartres.

Four days earlier, G.B.I/11 and II/11 had gathered their LeO 451's and trained crews to form an operational unit headed by the C.O. of I/11. Moving to the Marigny-le-Grand and Pont-sur-Yonne airfields, G.B.I/11 reached Etampes on 23rd May. Its first war operation took place two days later south of Bapaume. G.B. II/23 of *Groupement 7* reinforced G.B.I/11 at Etampes with 13 LeO 451's, while I/23, deprived of its LeO's, undertook night bombing operations from Chaumont airfield flying the Bloch 210.

Groupement 6 resumed operations on 28th May, 21 of its aircraft attacking bridges in the Aubigny area under the protection of British Hurricanes. On 31st May, 16 LeO's reinforced by four from G.B.I/11 were dispatched by day without fighter cover over Amiens and Abbeville. Nine did not return; all four of the I/11 aircraft were among those lost.

On 1st June, the *Groupement 6* units were moved from the Z.O.A.N. (*Zone d'Opérations Aériennes Nord*) to the Z.O.A.E. (E for *Est*); G.B.I/12 and II/12 moved to Montbard and Tavaux, I/31 to Châlons-sur-Saône, and II/31 to Til-Chatel. Because of the heavy losses in daylight operations and the difficulty in supplying fighter cover, *Groupement 6* was transferred to night operations.

On 2nd June, G.B.I/23 was recalled to Orange to resume training on the LeO 451. Two days later, *Groupement 6* started night operations with a raid on the Munich and Augsburg B.M.W. plants. Due to bad weather, only two machines located the targets, one being shot down by "flak". The critical situation of the land armies necessitated the return of LeO 451 units to daylight operations. On 6th June, ten Bf 109's and five Bf 110's intercepted 14 LeO's of *Groupement 6* over Chaulnes; three German aircraft were destroyed three LeO's were shot down in flames and two further aircraft crashed on the way back to base. Another sortie was flown against the same target on the same day by three machines of G.B.II/23 and four of G.B.I/11; one single aircraft of II/23 came home.

On 14th June, the LeO 451-equipped *Groupes de Bombardement* were ordered to prepare to retire to North Africa. *Groupement 6* was withdrawn to Istres, and G.B.I/11 to Bordeaux-Mérignac, whence it was followed two days later by G.B.II/25.

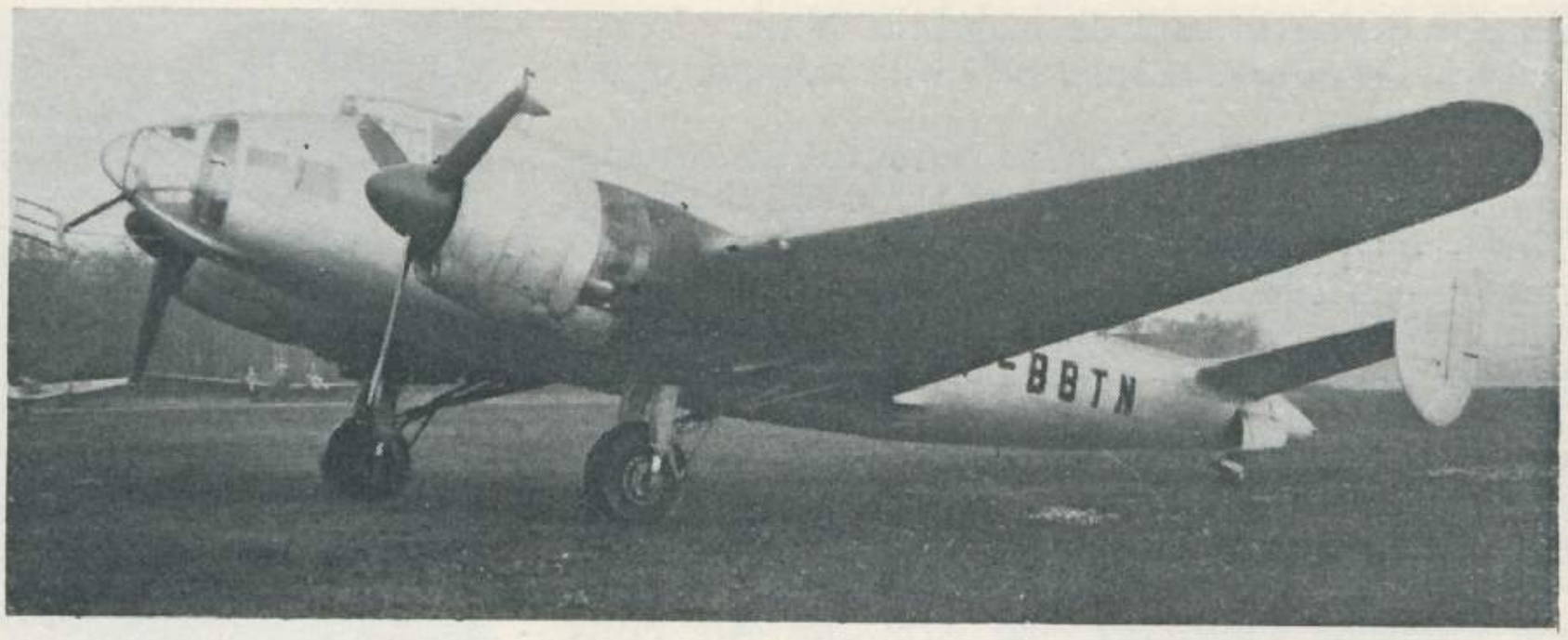
In the Z.O.A.A. (*Zone d'Opérations Aériennes des Alpes*) G.B.II/11 and I/23, fully-equipped with the LeO 451, were joined by I/25 which transferred from Tunisia in late May. G.B.I/25 left its obsolete Bloch 200's in Tunisia and began conversion to the LeO on arrival in France. These units were involved in attacks on military targets in Italy at Novi-Ligure and Vado-Ligure on the nights of the 13th and 14th June.

On 17th June, *Groupement 7* (G.B.I/23 and II/23) and *11* (G.B.I/11 and II/11) were ordered to reach North Africa, only 11 bomber *Groupes* (among them I/12, II/12, I/31 and II/31 of *Groupement 6*) being retained in the homeland.

The last day sortie by the LeO 45 during the 1939-40 campaign was carried out in the afternoon of 24th June by eleven aircraft of *Groupement 6*; only four of these could identify the targets, some temporary bridges at Sault-Brenaz and the Culoz bridge.

On 25th June, as the Armistice became effective, the *Groupement 6* war diary read as follows: approximately 400 sorties against enemy targets, 320 tons of bombs dropped, 31 LeO 451's shot down by German "flak" or fighters, 40 written-off due to battle-damage or destruction on the ground, and five destroyed accidentally.

On this date, the LeO 45 order of battle was as follows:



Two civilians: (above) F-BBTN, *Leo 455 Ph No. 3 of the* Institut Géographique Nationale, *and,* (*below*) F-BBYY, *a LeO 453 of I.G.N. photographed at Tan-Sin-Nhut, Indochina, on 29th September 1953.*

In the homeland:
G.B.I/12 (except for five aircraft at Blida), G.B. II/12 at Istres, G.B.I/31 and II/31 at Arles-les-Chanoines; these four units totalling about 45 aircraft.

In Algeria:
G.B.I/11 and II/11 with 18 aircraft, and G.B.I/23 and II/23 with nine aircraft, i.e., 32 LeO 45 bombers at Blida, including the five machines of G.B.I/12.

In Tunisia:
G.B.I/25 at El Batham with nine LeO 45's (and a few LeO's in service with the Douglas DB 7-equipped G.B.II/61 at Souk-el-Arba).

Furthermore, the 1B *Escadrille* of *Aéronavale* was in Morocco at Camp Cazes with six LeO 451's received in June, too late to participate in the fighting. There were also a few in other *Armée de l'Air* units, for instance five LeO's with G.R.I/55 and three with G.A.O.521 at Maison Blanche.

Out of 452 LeO 45 aircraft completed before the armistice, 373 had been taken on charge, including 13 accepted by the *Aéronavale*. One hundred and eighty-three machines remained in the homeland, only 72 of these being ready for immediate action, and about 135 in North Africa. Total losses of the 1939-40 compaign are now estimated to be about 130 LeO 45's.

Meanwhile, the prototype LeO 455-01 had flown for the first time at Marignane on 3rd December 1939; it was later destroyed in a bombing attack. Another prototype, the LeO 454 fitted with Bristol Hercules II engines, was nearing completion at Marignane, but it remained unfinished after the armistice.

IN THE ARMISTICE AIR FORCE

In July 1940, the Germans ordered 13 *Groupes de Bombardement* to be disbanded. Among these were three LeO 45 units, G.B.II/12, II/31 and II/11. The *Aéronavale* 1B *Escadrille* transferred its LeO 45's to the Air Force and re-equipped with the Martin 167F.

At the end of September 1940, seven LeO 45 units remained in service:

I/12 and I/31 at Istres, which with the Amiot 143-equipped G.B.I/38 and II/38 constituted *Groupement 6*. In 1941, the Amiot 143's of these latter units were replaced by LeO 45's.

G.B.I/25 and II/25 at Tunis-El Aouïna—originally flying LeO 257*bis* biplanes. G.B.II/25 had transferred to the LeO 45 in August. Both *groupes* formed *Groupement 8*.

G.B.I/11 at Oran-La Sénia; with I/19 and II/61 (flying the Douglas DB 7) this unit comprised *Groupement* 3.

G.B.I/23 and II/23 at Meknès, forming with I/32 and II/32 (both DB 7-equipped) *Groupement 11*.

On the 23rd and 24th September 1940, G.B.I/11, I/23, II/23 and II/25 took part in bombing raids on Gibraltar as a reprisal for the attack on Dakar by Gaullist forces. During the second operation, one machine of II/23 was shot down into the sea by British A.A. fire.

During 1941 all existing LeO 45's were slightly modified, the main alteration being the fitment of new twin fins and rudders of increased area that had been previously tested in March 1940 on LeO 451 No. 51. The cannon turret was fitted with two additional 7·5 mm. machine guns with 750 r.p.g. to improve the rearward defence which had proved deficent. Also during this time, G.B.I/11 experimented with at least three machines as semi-dive bombers.

G.B.I/12 and I/31 moved to Syria in June 1941 (later followed by I/25), to reinforce the bomber force consisting of twelve Martin 167F's (G.B.I/39) and six Bloch 200's (*Escadrille* 3/39). This small striking force carried out a total of 855 sorties: five LeO's were lost in combat, twelve were destroyed on the ground, and eleven written off in accidents.

Aéronavale 4F *Flotille*, comprising 6B and 7B *Escadrilles*, left Syria with only one Martin 167F in the early summer of 1941 and reformed in July 1941 at Tafaroui (Algeria) with the LeO 45. LeO 451 No. 359 of *Aéronavale* was secretly modified to a special version similar to the Wellington D.W.1 (see *Profile* No. 125). It was equipped with an internal motor to create a magnetic field in a large external

circular casing to explode magnetic mines. It was first test flown on 3rd June 1942 with Lecarme at the controls.

In April 1941, the Germans permitted the resumption of aircraft manufacture in Unoccupied France. The *Secrétariat d'Etat à l'Aviation*, the Vichy Government's Air Ministry, placed contract No. 179/41 with S.N.C.A.S.E. on 20th August 1941. This called for 225 LeO 451's to be manufactured at Ambérieu. To facilitate this, all components and sub-assemblies stored on German orders in the Occupied Zone were released and delivered to the Ambérieu plant. The first machine from the new batch, LeO 451 No. 453, made its first flight on 16th October 1941. During the following December, the Armistice Air Force took on charge its first three aircraft from the new production batch: Nos. 455, 456 and 459.

At this time, total strength of the LeO 45 was only 201 aircraft, but new production brought this figure up to 270 machines by 1st October 1942.

G.R.I/22 (*Groupe de Reconnaissance*) stationed at Oulad-Okba near Rabat-Salé began to exchange its Martin 167F aircraft for LeO's in May 1942.

THE ALLIED LANDINGS IN NORTH AFRICA

At the time of the Allied landings in North Africa on 8th November 1942, 109 aircraft had been delivered against contract No. 179/41, the highest serial being No. 581. As a consequence of the Allied landings, the Germans invaded the Unoccupied Zone. All Armistice Air Force units were disbanded on 28th November 1942, including G.B.I/12 and I/31 at Ambérieu, and I/38 and II/38 at Lyons-Bron. The Germans seized 94 LeO's, among them nine unserviceable machines.

The units stationed in North Africa had a statutory strength of 13 aircraft and the LeO 45-equipped units were as follows:

In Morocco: G.B.I/23 at Marrakesh, II/23 at Meknès, and G.R.I/22 at Rabat-Salé.

In Algeria: G.B.I/11 at Oran-la-Sénia, *Aéronavale* 4F *Flotille* at Tafaroui. There were also two LeO 451's in the ranks of G.B.II/61 (Douglas DB 7) at Blida.

In Tunisia: G.B.I/25 and II/25 at Tunis-El Aouïna.

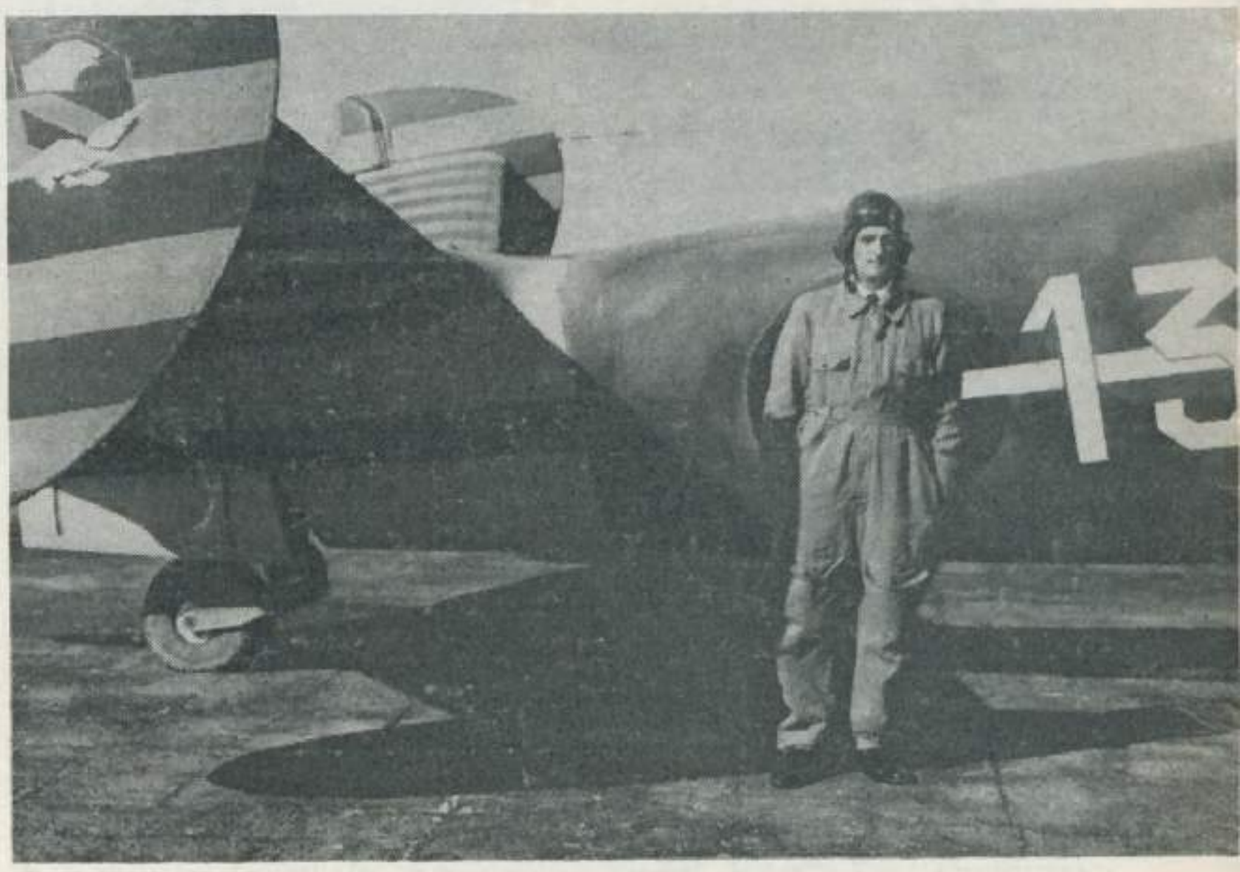
During the attacks on their airfields by the Allied air forces, G.B.I/11 lost two aircraft destroyed on the ground and one shot down by A.A. fire, while G.R.I/22 lost nine LeO's shot down by British Fleet Air Arm Grumman Martlet fighters.

ALLIED SERVICE ONCE MORE

During the Allied landings, G.B.I/25 and II/25 had been ordered to retreat to Aïn-Oussera (Algeria). On 31st December 1942, II/25 was disbanded, its machines and crews reinforcing I/25. Between 18th and 28th January 1943, G.B.I/25 transported 180 tons of ammunition for the U.S.A.A.F.

Groupement Mixte 8 was constituted in February 1943 and became part of N.A.T.A.F. (Northwest African Tactical Air Force). It embodied G.B.I/25 and II/23 at Biskra, these units each being strengthened by an *Escadrille* of G.B.I/11 at Colomb-Bechar. Their first night bombing sortie was made over Nefta (Tunisia) on 24th February 1943. Despite serviceability problems due to a lack of spares, G.B. I/25 and II/25 carried out over 80 night sorties in 200 flying hours by 25th April, dropping over 100

Two C.O.'s of G.B.I/12 at Istres, (above), *September 1940, Cdt. Ruth and his aircraft, showing the retractable step in the starboard wing trailing-edge and the dorsal cannon, re-inforced by two machine-guns. The fairing around the cannon limited the arc of fire to prevent damage to the tailplane.* (Below) *May 1942. Cdt. Fine and his LeO 451 showing the modified shape of the twin fins with increased area. Note the different styles of the unit badge.*



tons of bombs on enemy targets in Tunisia. One machine of II/23 was lost on 5th April over El Aouïna and one of I/11 was lost in a training accident.

G.B.I/25 and II/23 moved to Thelepte on 10th May 1943 and G.B.I/11 to the famous Foreign Legion town of Sidi-bel-Abbès. These groups then faced three months of inactivity. G.B.I/23 was disbanded at this time, soon followed by I/11. This latter unit's crews and machines, eight in number (Nos. 178, 280, 284, 317, 360, 379, 426 and 436), was incorporated into II/23, then at Meknès.

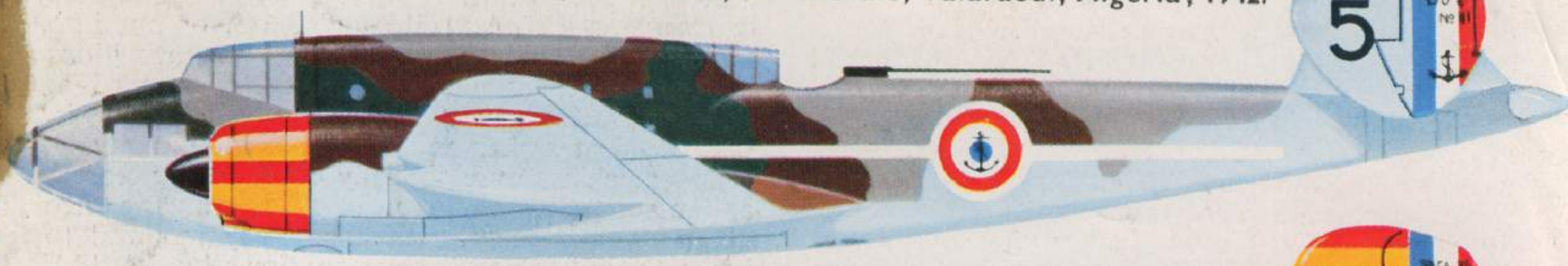
The following August, G.B.II/23 and I/25 were mustered at Zeralda, near Algiers. Leaving their LeO's in North Africa, they embarked for Britain on 28th September, where, at Elvington, they formed Nos. 346 (*Guyenne*) and 347 (*Tunisie*) Squadrons, R.A.F. with Halifaxes (see *Profile* No. 11).

The 4F *Flotille* used its Martin 167F and LeO 45 aircraft for Coastal Command patrols off the Canary Isles for a period of several months. On 1st July 1943, the unit was disbanded and its aircraft were collected at Port Lyautey for training and communications purposes.

G.B.I/22 "Maroc" exchanged its LeO's for Marauders late in September 1943, and joined the *31e Escadre de Bombardement Moyen* which later took part in the Italian campaign.

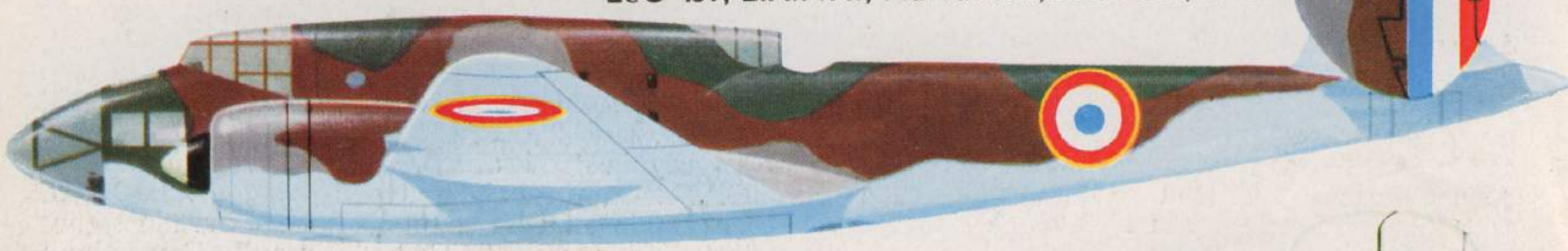
© WARRD—

LeO 451, 4F Flotille, Aéronavale, Tafaraoui, Algeria; 1942.



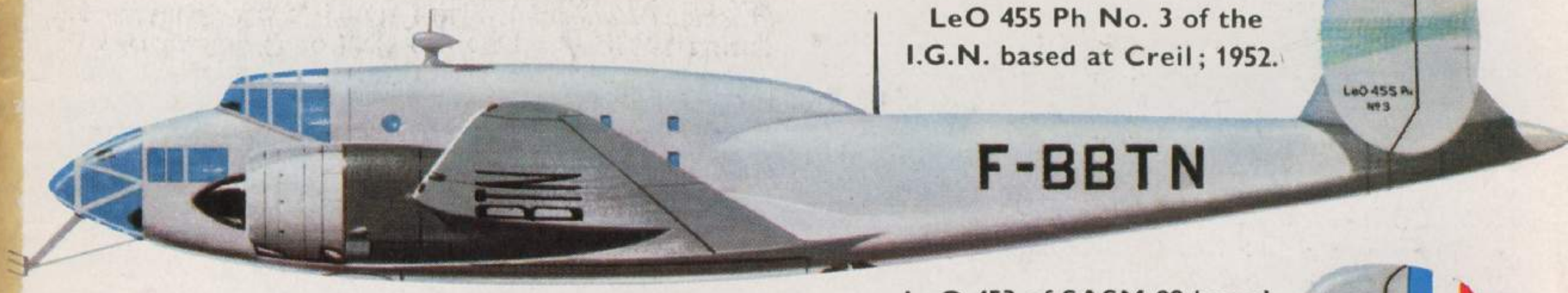
LeO 451, 4F Flotille, Aéronavale; 1942.

LeO 451, E.A.P.N., Marrakech, Morocco; 1943.

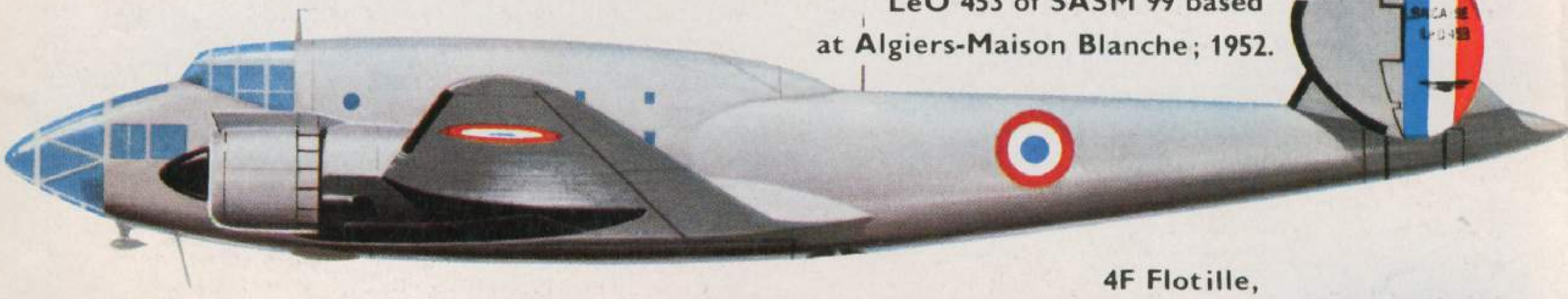


LeO 453, F-BBYV, of the *Institut Géographique National* based at Creil; 1950.

LeO 455 Ph No. 3 of the I.G.N. based at Creil; 1952.



LeO 453 of SASM 99 based at Algiers-Maison Blanche; 1952.



4F Flotille, 6B Escadrille.

G.B.I/31.

G.B.I/12.

Aéronavale.

Early in 1943 the E.A.P.N. (*Ecole d'Application du Personnel Naviguant*) was created at Marrakesh; this was a similar unit to an R.A.F. O.T.U. and it made use of the airstrip at Sidi-Zouine. The B1 *Escadrille*, a component unit of the E.A.P.N., was equipped with the LeO 45. In 1944 it became part of the C.I.B. (*Centre d'Instruction du Bombardement*) which replaced the E.A.P.N. at Marrakesh when its fighter *Escadrilles* were transferred to Meknès to form the C.I.C. (*Centre d'Instruction de Chasse*). The LeO 45's were withdrawn from use at the C.I.B. during 1945 and replaced by Wellingtons and Marauders.

THE LeO 45 IN ENEMY SERVICE

A few of the LeO 45's seized by the *Luftwaffe* were passed to the *Regia Aeronautica* and flown by the *51° Gruppo B.T.* and the *Reparti Scuola della Specialita Bombardimento*.

The *Luftwaffe* had no interest in the LeO 45 as a bomber, but was short of transport aircraft. The Marignane plant was ordered to convert LeO 451 Nos. 515 and 546 to LeO 451T (for *Transport*) configuration for use as fuel and personnel transports. These modified aircraft could carry eight 200 litre fuel drums or 17 troops. A number of LeO 451's were converted to LeO 451T configuration at Marignane in 1943-44. *Kampfgruppe z.b.V.* 700 at Le Bourget was equipped with the type from early in 1943.

POSTWAR SERVICE

At the end of World War Two, 67 LeO 45's remained (45 in North Africa and 22 in Metropolitan France), most of them in very poor condition. During 1945-46, the D.T.I.A. (*Direction Technique et Industrielle de l'Air*) took on charge 14 of the machines remaining in France and returned them to the S.N.C.A.S.E. plant at Marignane for conversion. Eleven of these were modified to LeO 451E (for *Essais*) configuration and used by S.N.C.A.S.E. and O.N.E.R.A. as flying laboratories and testbeds, e.g. for the launching of special weapons such as the S.E. 1500, the E.C.A. 30 and the S.F.E.C.M.A.S. Arsenal 5501. The three other machines (formerly LeO 451 Nos. 602, 499 and 500) were redesignated LeO 455 Nos. 3, 4 and 5 and loaned to the nationalised engine manufacturer S.N.E.C.M.A. for in-flight development of the Gnome-Rhône 14R: this work was undertaken at Villacoublay and Villaroche from June 1947 onwards. Fitted with a two-speed supercharger, this engine ultimately developed 1,335 h.p. at 2,500 m. (8,202 ft.) and 1,225 h.p. at 6,700 m. (21,982 ft.).

In 1946, one of the Algerian-based machines had its armament removed and was experimentally converted as a fast communications machine by the No. 1 A.I.A. (*Atelier Industrielle de l'Air*) at Algiers-Maison Blanche. There was a shortage of spares for its original engines (Gnome-Rhône 14N), so these were replaced by 1,200 h.p. Pratt & Whitney R-1830-67 engines and the aircraft redesignated LeO 453 No. 1. This machine was capable of carrying six passengers at a cruising speed of 400 km./h. (248 m.p.h.) with a radius of action of 3,500 km. (2,175 ml.). From 1947 onwards 39 further LeO 451's were similarly converted, the batch being re-numbered LeO 453 Nos. 2 to 40 with no relationship to their original serial. The first 30 of these were intended for the *Armée de l'Air*. Most of these were, however held in reserve at E.A.A. 1/615 and 3/615, or put into service in 1947 with various overseas communications units: G.L.A. (*Groupe de Liaison Aérienne*) 45 at Boufarik, G.L.A. 46 at Rabat, G.L.A. 47 at Tunis, G.L.A. 48 at Dakar and G.L.A. 49 at Brazzaville. A few machines were specially equipped for search-and-rescue tasks with a crew of eight, including three observers, and the fuselage bomb-bay modified to house three dinghies. They were flown by S.A.S.M. (*Section Aérienne de Sauvetage Maritime*) 98 at Istres and S.A.S.M.99 at Maison Blanche.

LeO 453's from No. 35 onwards were delivered to *Aéronavale Escadrille 11S* at Les Mureaux, from June 1951, and for a short while undertook S.A.R. duties. Early in 1952, these machines were transferred to G.L.A. 45.

From 22 in service in mid-1950, the total number of LeO 453's remaining in use gradually decreased to 13 in 1952, two of which were at G.L.A. 48 and eleven at G.L.A. 45 which had amalgamated the disbanded S.A.S.M. units. Between 1952 and 1954, the following aircraft were on the strength of G.L.A. 45: Nos. 5, 13, 16, 17, 18, 23, 25, 27, 28, 30, 35, 38 and 39.

Early in 1956 when G.L.A. 45 was disbanded, G.L.A. 48, the only unit still flying the LeO 453, was equipped with a total of eight machines (not including a few AAC 1 "Toucan"—French-built Ju 52/3—transports). The LeO 45's career finally came to an end when the last two LeO 453's of G.L.A. 48 were declared obsolete and put out of service in September 1957.*

A few found their way into civil use. Two LeO 453's registered F-BBYV (No. 31) and F-BBYY, together with two B-17's, were used from 1947 by the *4e Escadrille* of the G.E.P. (*Groupe d'Escadrilles Photographiques*) based at Creil, which was entrusted with mapping tasks for the I.G.N. (*Institut Géographique Nationale*). Five LeO 451's were converted during 1948-50 as LeO 455 Ph (for *Photographique*) aircraft being fitted with larger elliptical-shaped vertical tail surfaces and 1,600 h.p. S.N.E.C.M.A. 14R engines. Numbered from 1 to 5 they were respectively registered: F-BBLD, F-BBTM, F-BBTN, F-BBTO and F-BCAG. Until 1956, they formed the *3e Escadrille* of the G.E.P.

* In April, 1957, Nos. 5, 12, 15, 17 and 30 still remained in service.

© *Raymond Danel, 1967*

SPECIFICATION

Powerplant: Two Gnome-Rhône 14 N 48/49 engines rated at 920 h.p. at sea level at 2,400 r.p.m., and 1,060 h.p. at 4,800 m. (15,748 ft.). Some aircraft were fitted with 14 N 38/39 engines.
Dimensions: Span, 73 ft. 10½ in. (22·52 m.), length, 56 ft. 2½ in. (17·17 m.), height, 17 ft. 2¼ in. (5·24 m.); wing area, 710·4 sq. ft. (66 sq. m.).
Armament: One 20 mm. cannon and two (four from 1941) 7·5 mm. machine-guns. Maximum bomb load, with only 398 Imp. gall. (1,810 litres) fuel, 3,086 lb. (1,400 kg.)
Weights: Empty weight, 16,600lb. (7,530 kg.); maximum loaded, 25,128 lb. (11,398 kg.).
Performance: Maximum speed, 227 m.p.h. (365 km./h.) at sea level, 298 m.p.h. (480 km./h.) at 15,748 ft. (4,800 m.); maximum cruise, 261 m.p.h. (420 km./h.) at 15,748 ft.; maximum range, 1,802 ml. (2,900 km.) at 231 m.p.h. (372 km./h.) economical cruising speed at 15,748 ft. with 712 Imp. gall. (3,235 l.) maximum fuel capacity.

PRINTED IN ENGLAND. © Profile Publications Ltd., P.O. Box 26, Leatherhead, Surrey, England
by George Falkner & Sons Ltd., for McCorquodale City Printing Division, London.